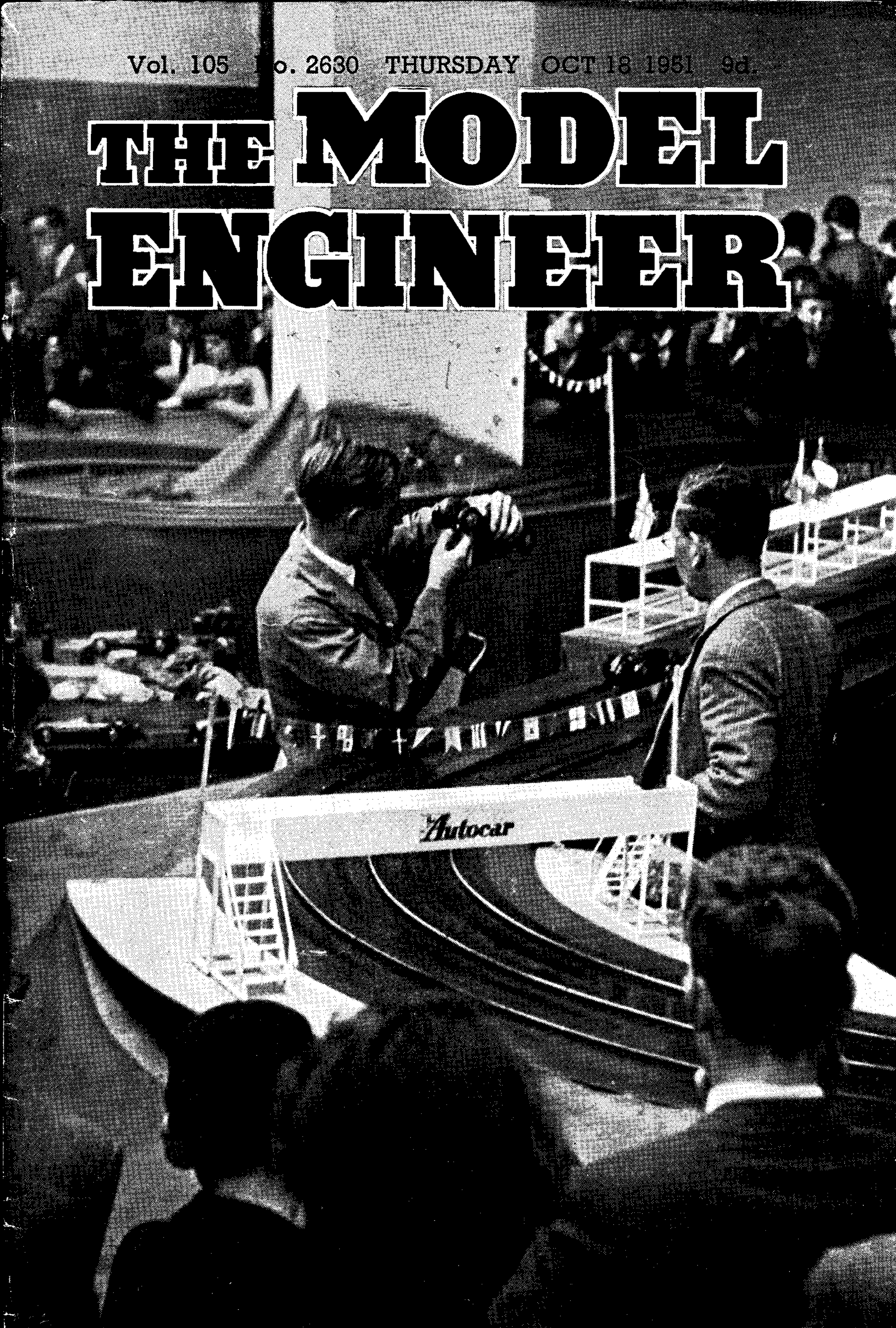
Vol. 105 No. 2630 THURSDAY OCT 18 1951 9d.

# THE MODEL ENGINEER



# The MODEL ENGINEER

*PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2*

18TH OCTOBER 1951 VOL. 105 NO. 2630



# SMOKE RINGS

## Our Cover Picture

● THE PHOTOGRAPH this week links with the series on Miniature Grand Prix Racing now appearing, and shows a section of the circuit at the 1951 "M.E." Exhibition.

The raised surface proved a popular innovation, allowing spectators all around the track to have an unobstructed view of the start and finish, as well as making the work of the operators very much easier. The addition of the footbridge and pits added to the general effect, but even greater realism could be obtained by the incorporation of scenic paraphernalia, straw bales, etc. They were omitted from this particular circuit because of the tendency of our younger visitors to carry out experiments in obstacle racing!

## Tolerance

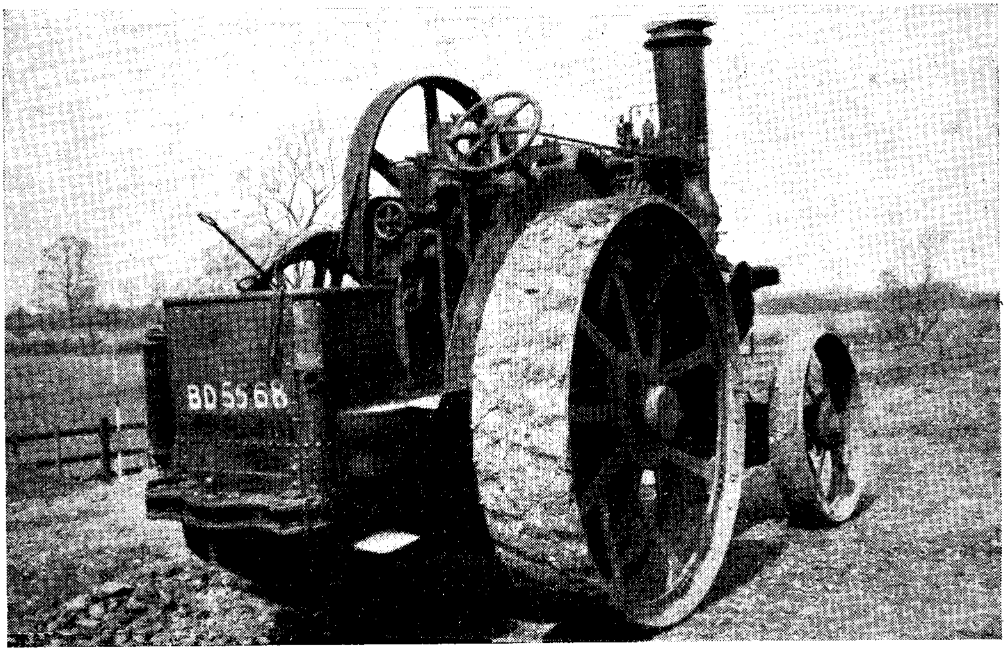
● TO MOST of us, perhaps, this word immediately suggests a few "thous" over or under which a component is to be machined if it is to be satisfactory for the required job. However, we have just been reading an apt little article written by Mr. Leslie Oldridge and published in the latest issue of the Exeter and District Model Engineers' Society's "Bulletin." Mr. Oldridge quite rightly points out that there is another kind of "tolerance" which affects the model engineer; he writes: "... Our society tries to cater for a variety of interests from 'OO' railways to 5-in. gauge live steam locos, from microscopes to traction engines. One cannot expect the 'OO' enthusiast to go into raptures over a Burrell scenic road loco, or the builder of a marine engine to enthuse over model architecture, but it is not difficult to appreciate the craftsmanship in any of these subjects. We should, therefore, be tolerant of the other fellow's efforts, even although we are not ourselves interested in his branch of the hobby. Personally, I admire the builder of any model, provided he puts his best efforts into the work and makes the best job he can of the model."

There is a great truth in those comments, and we make no excuse for giving them rather wider publicity than they might otherwise have had. Each of us has his own particular choice of subject for modelling, but that should not obscure our appreciation of the work of others. This applies especially to societies which claim to be *model engineering* societies, in which all the members are, or should be, interested in the hobby as a whole; but it also applies with equal force to societies which cater for specific branches of the hobby, *e.g.*, locomotives, ships or motor-cars; the geater the tolerance displayed by each member, the more smoothly do the affairs of the society proceed and the more rapidly does the society progress.

## Calling Harlow

● FROM MR. C. O. POUND, of Harlow, we learn that there is a proposal to form a Society of Model and Experimental Engineers in that district. One of the main obstacles has been overcome as a result of a generous offer from Mr. H. G. Vernon, of Vernon's Tools Ltd., to place at the disposal of the club his factory on the Harlow Industrial Estate, for the purposes of workshop and clubroom. There are also hopes that, if the club becomes established, facilities will be available for the construction of a multi-gauge locomotive track and a pond for boats.

Readers interested are invited to get into touch either with Mr. C. O. Pound, 108, Chippingfield, Harlow, Essex, or with Mr. H. G. Vernon, 123, Tany's Dell, Mark Hall, Harlow, Essex.




## The Traction Engines at Weedon

● AS IS usual in such cases, we did not have to wait long after the publication of our note asking if anyone knew anything about a traction engine we had seen near Weedon. We are very grateful to those readers who wrote to us about it, especially to Messrs. G. W. Cox and J. G. Click, of Rugby, and to Mr. G. Main, of Northampton. These three gentlemen seem to have taken the trouble to visit the site to glean information and even photographs.

The work in progress is the reconstruction of the London-Holyhead Road (Watling Street) between Welton Station and Ryehill Farm. The level of the road is being raised, and to accomplish this, earth is pushed into place and levelled by means of a bulldozer and large scraper. The traction engine then travels backwards and forwards over the levelled surface to consolidate it.

There are two engines on the site, one of them, unfortunately, a cripple due to a defect in the steering gear. This engine is a Fowler, No. 8975, and her portrait taken by Mr. G. W. Cox is reproduced on this page. The defective steering gear is under repair; otherwise the engine is in good condition and, according to the Clerk of Works, was being driven by the same man who took delivery of her from Fowlers in 1902!

Meanwhile, the second engine, which was sent to the site to carry on the work while the Fowler is under repair, is very busy; she is an Allchin, No. 1267, fitted with an extra belly-tank for water. Both engines belong to Tate Bros., of Farthingstone, Towcester, Northants.

## Glasgow S.M.E. Report

● WE HAVE received a copy of the Glasgow Society of Model Engineers' report for the year ending September, 1951, and it shows that the society is in a sound position after a very active session.

The principal item on the year's programme was the bringing into use of the locomotive test track at Rutherglen last May, since when several visitors from other districts have availed themselves of the invitation from Glasgow to take advantage of the facilities available for the running and testing of locomotives up to 5-in. gauge.

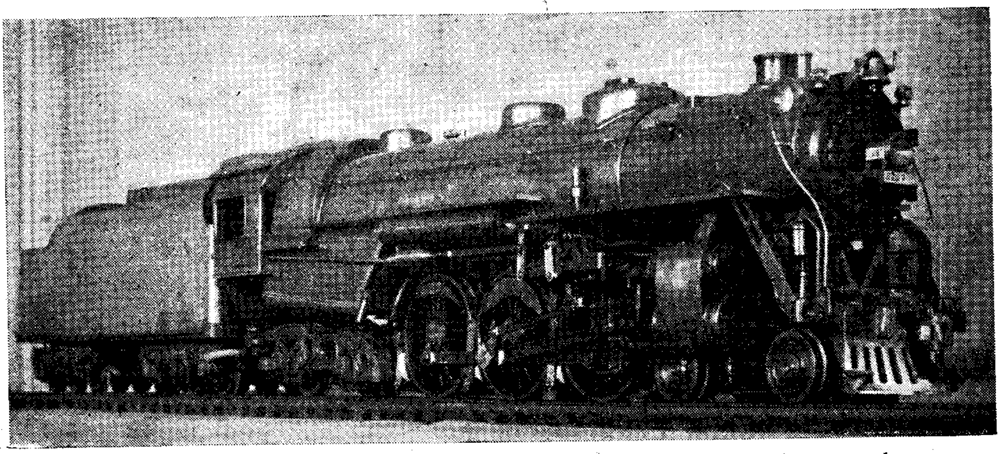
Another most successful event was a power boat regatta held at Renfrew during the Civic Week in conjunction with the "Festival of Britain" celebrations.

The club's premises have been kept in good repair and the lounge-cum-committee room is in course of redecoration. A new fireplace has replaced the original one and, after the tiling has been completed and some other improvements finished, a nice, cosy room will be available.

# TWO AMERICAN $2\frac{1}{2}$-in. GAUGE LOCOS.

## by V. T. SHATTOCK

THE photographs reproduced herewith are of two $2\frac{1}{2}$-in. gauge steam locomotives built by one of the members of the Golden Gate Live Steamers Inc., Mr. Walter I. Brown of Oakland, California. Both locomotives represent New York Central Railroad practice; one is a copy of the famous "999" which is credited with making a speed of $112\frac{1}{2}$ miles per hour back in 1897, a real accomplishment in those days. The other is a copy of the more modern Hudson type 4-6-4 which have proved so practical in handling express passenger service.



The Hudson follows the general run of small locomotive construction. The boiler is made of copper and is hard-soldered in all seams and flue-tubes; it has a combustion chamber with four $\frac{3}{8}$-in. water-tube struts, eleven $\frac{3}{8}$-in. and two $\frac{1}{2}$-in. flue-tubes, the two larger diameter being used for superheater elements. The two cylinders are $\frac{7}{8}$ in. bore and $1\frac{3}{16}$ in. stroke with $\frac{7}{16}$ in. diameter piston-valves operated by Baker valve-gear. Drive wheels are $5\frac{3}{8}$ in. diameter. The engine has one axle-driven feed water pump, also a mechanical lubricator of the plunger type fed from a small tank from which oil drips into a sump on the lubricator and is then forced by the plunger into the steam line to cylinders.

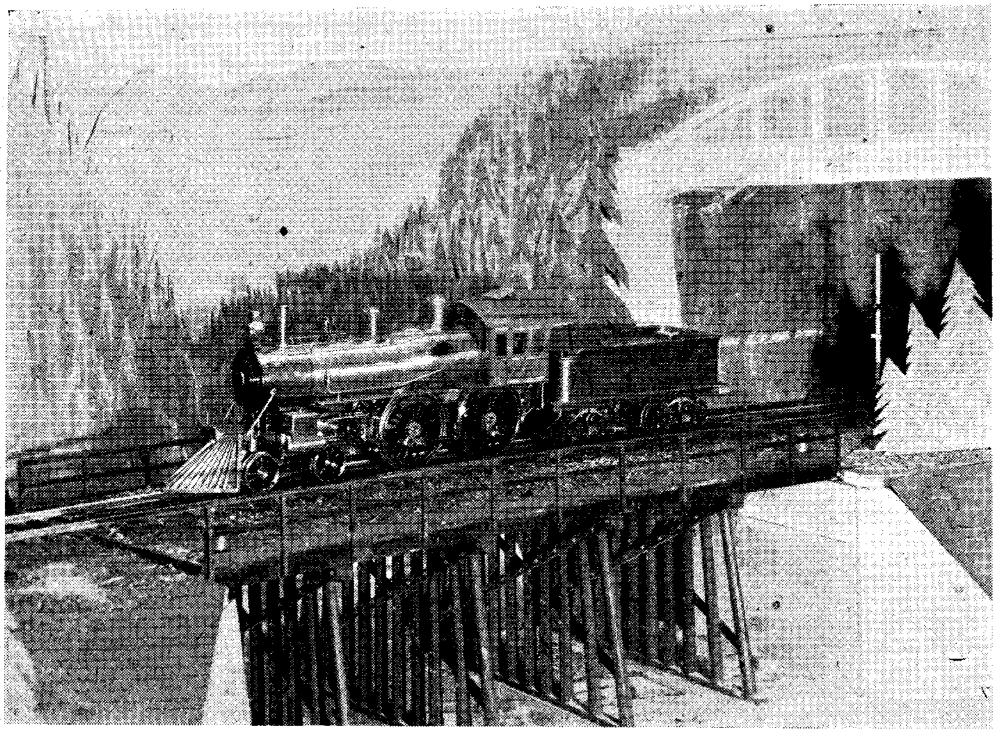
Fuel used is denatured alcohol (methylated spirit to you) vaporised in a special type of burner which has proved quite satisfactory here for firing $2\frac{1}{2}$-in. gauge locomotives.

Mr. Brown built this engine in 1936-37, and it did most of its running on the writer's basement scenic railway; however, when tracks for passenger hauling became available in later years, it demonstrated its ability to handle heavy loads with a minimum consumption of water and fuel.

The "999," a 4-4-0 American type, is an exceptionally fine piece of workmanship, and Walter Brown went to extreme lengths to make this counterpart of the old "999" operate as well as, or better than its appearance, as hundreds who have seen it under steam can testify.

The cylinders are $\frac{13}{16}$ in. bore and $1\frac{1}{8}$ in. stroke with $\frac{7}{16}$ in. diameter *piston* valves. The prototype has slide valves, but when Walter made his patterns for the cylinders he decided he would use the more efficient piston-valves with long travel. However, he gave himself something of a problem in arranging for steam and exhaust passages, a the same time preserving the outward appearance of the prototype with its square steamchest. The valves are operated by Stephenson's gear located between the frames and by rocker arms to the steamchests. The drivers are $3\frac{9}{16}$ in. diameter cast from patterns made by Mr. Brown and, as in big practice, he machined the inner wheels and shrunk on steel tyres. Blueprints of this small locomotive not being available, Mr. Brown was obliged to design the valve-gear, and so confident was he of the results, he made the square keyways for the four eccentrics and the axle before the links were made which, to my way of thinking, is like doing crossword puzzles with pen and ink. Square keyways for the drive wheels were cut in the axles for quartering before the wheels were machined. The main and side rods are made from stainless-steel, and the latter are on the outside of the crankpins, as was the practice when the prototype was built, in 1893.

Lubrication is furnished by means of a ratchet mechanical lubricator located in a tank between the frames just back of the smokebox. On the prototype this tank is an air reservoir for brakes. The tank on Mr. Brown's engine is split in halves, the lower portion containing the mechanical lubricator and oil, the upper portion being the lid. So well is this tank constructed, the casual observer, seeing no apparent opening or joint, often asks how the oil is put into the tank.



Despite the "perfect" fit, however, the lid can be removed and replaced for filling purposes quite easily by the use of a small screwdriver or similar tool.

The boiler is made from a piece of 3-in. copper tube and, in order to obtain the correct shape of the "wagon top," Mr. Brown swedged the tube from 3 in. to $2\frac{5}{8}$ in. diameter just ahead of the firebox. There are nine $\frac{3}{8}$-in. and two $\frac{1}{2}$-in. flue-tubes, the latter being used for the superheater elements. All joints are hard-soldered with phos-copper and silver-solder. The safety-valve, set to 100 p.s.i., is located under the removable dome over the firebox and steam is taken from the dome in the middle of the boiler through a rotating throttle-valve. The fuel is denatured alcohol, or "meth," vaporised in a copper box containing air inlets and located in the position occupied by a grate when solid fuel is used. The boiler has, of course, all the usual fittings such as steam and water gauges, blower, etc., and the roof of the cab is removable for convenience of operation when the locomotive is used for passenger hauling. The tender is typical of the practice used back in the "90's," that is, for size and shape of the tender and the four-wheel trucks and springs. The alcohol tank is not shown in this picture. It is removable and when the engine is in use it is fastened to the top of the front of the tender where the coal ordinarily would be placed. Feedwater to the boiler is pumped from the tender by an axle-driven pump with a by-pass to return surplus water to the tender.

Details such as the headlight, the pilot or cow-catcher, hand-rails, the bell, the numbers on the cab, the old type "link and pin" couplers, the reverse lever and quadrant have to be seen to appreciate the work put into their construction, and an interesting story could be weaved around the making of each detail.

The picture shows the engine standing on a ballast deck or trestle bridge on the writer's basement railroad, which has been something of a testing track for $2\frac{1}{2}$-in. gauge locomotives. Walter's "999" came up and exceeded expectations in hauling cars at high speed around this basement road for long non-stop runs; but since our outdoor track in Redwood Park, Oakland, came into being, we were naturally interested in the performance of this little locomotive as a passenger-hauler. Up to the present time we have made no attempt to rate any locomotive by any certain performance, but it is simply amazing the low amount of fuel and water the "999" uses when making a run over our quarter-mile track while hauling two adults. Without question, Walter Brown's "999" is an engineering accomplishment both for workmanship and operation.

Mr. Brown has built a number of locomotives, steam and electric, of all of which he can be justly proud. He was the originator of the split smokebox idea for $2\frac{1}{2}$-in. gauge steam engines which permitted a builder to get to the plumbing in the front end of his locomotive, at least, much easier than when the smokebox is made in one piece.

# *AN EXPERIMENTAL STEAM TURBINE

## by J. A. Bamford

HAVING exhausted the possibilities of the Stuart boiler I got down to making a flash boiler. This consisted of 20 ft. of 22-s.w.g., $\frac{1}{4}$ in. o.d. mild-steel tubing wound into two closely wound parallel coils separated by about $\frac{3}{4}$ in. These were pulled out $1\frac{1}{2}$ in. and fitted into a tin case. The general arrangement is shown in Fig. 7.

It will be seen that the blowlamp flame passes up the centre of the coil and escapes between the individual coils. I hoped to put up the efficiency by this method, whether I did so or not, I do not know, but it certainly reduced the bulk considerably. The twin blowlamps were built up by experiment and were run on petrol to avoid difficulties at this stage. They were fed by an old Primus stove body, which held plenty of spirit to cope with their terrific thirst, about 1 pint in 5 min.

*Continued from page 477, "M.E.," October 11, 1951.

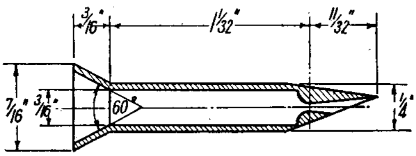



*Fig. 6. The final nozzle*

I then rigged up the boiler with a large hand pump to feed it, the hot end having attached to it the nozzle and a pressure gauge. I fired up and pumped water in, finding that, with the blowlamp flat out, I could evaporate half a pint of water per min, at about 200 lb. pressure and of

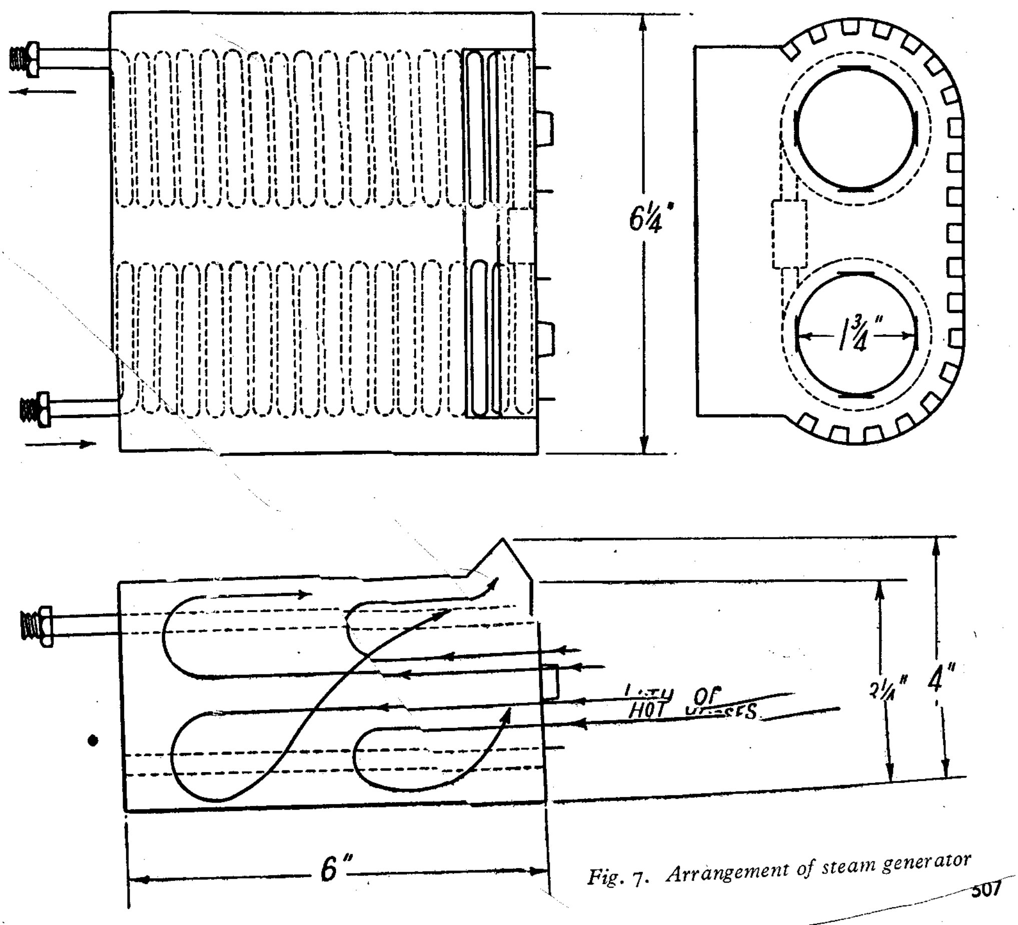
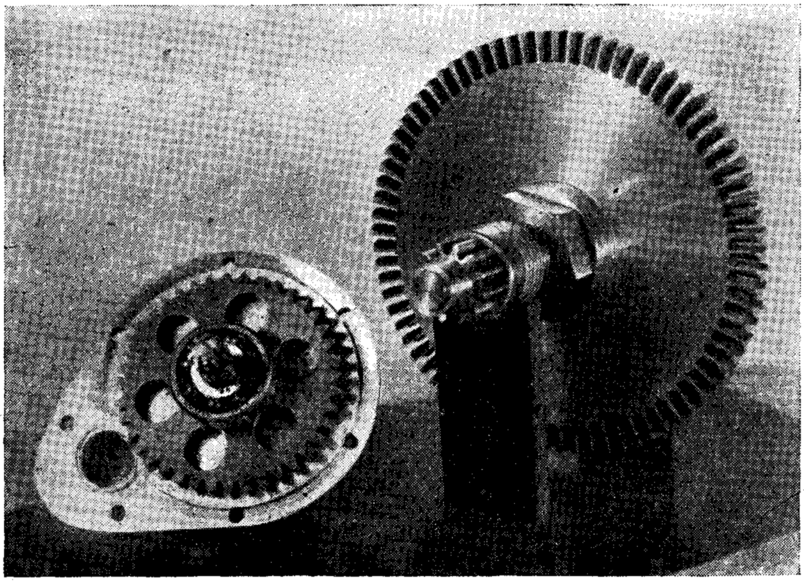



*Fig. 7. Arrangement of steam generator*

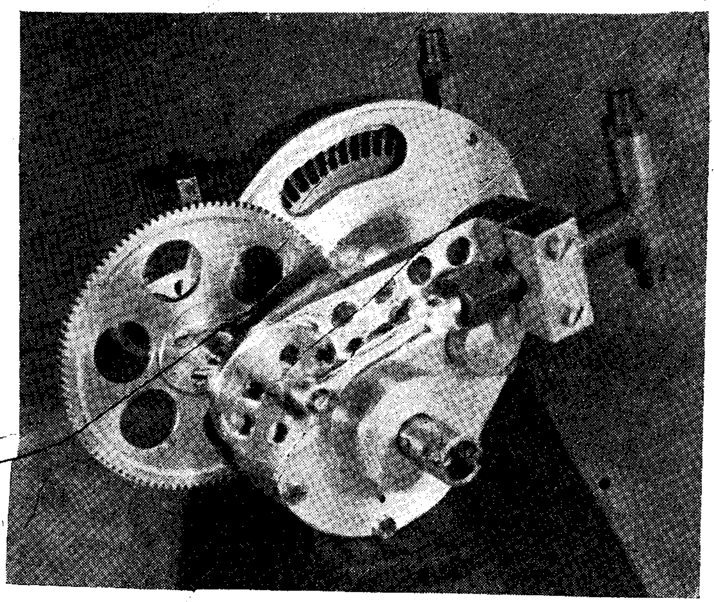


*Photograph No. 3. Turbine wheel and reduction gear*

considerable superheat. This seemed fine, so I proceeded to build a water pump driven by a 10 : 1 reduction from the output shaft, that would deliver this quantity of water at about 1,500 r.p.m. However, I made the usual variable stroke arrangements to adjust the water input. Photographs Nos. 3 and 4 show the complete turbine with both water and fuel pumps.

I now realised that to test the plant I should want some sort of brake to stop the wheel running away and flooding the boiler. After a bit of thought I evolved the apparatus shown in Fig. 8; very crude but most effective. It consists of a propeller running in a tin of water, the tin having an arm attached to it on which weights can be hung. The tin is allowed to pivot round the brake shaft. Knowing the r.p.m., wiehgt lifted, and radius of lift, the b.h.p. can be simply calculated. This brake is extremely sensitive, and its only drawback is the fact that, to alter the load, the lid must be twisted. This, of course, entails stopping the plant. However, this is not a serious drawback, because maximum power is the chief interest, and one does not run a plant like this longer than necessary, because of the fuel bill. I have run this brake at over 17,000 r.p.m. without any signs of cavitation. The water gets hot, of course, but not enough to upset the readings. Photograph No. 5 shows a view of the whole plant set up for testing.

The first run with the mechanical water pump merely resulted in the turbine running up the rev. scale and then priming. However, this was with the blowlamp well turned down, as I wanted to work up to maximum and not blow things up straight away. I, therefore, cut down on stroke till the plant ran evenly without hunting; this resulted in 0.165 b.h.p. The water input does not seem to be critical, I presume the performance depends on total heat input rather than total steam consumption. The first run had a duration of 15 min. After this I decided to strip the turbine for examination. I found a slight



*Photograph No. 4. The complete turbine unit*

yellow discoloration on the exhaust side of the wheel, the reason for which I could not fathom. All the leading edges of the blades were perfectly sharp and there was no sign of erosion. The gears were slightly polished and all ball-races were in perfect condition.

The next run consisted of pumping up the blowlamp to what I thought was a safe limit. I did not alter the water input and paid the penalty.

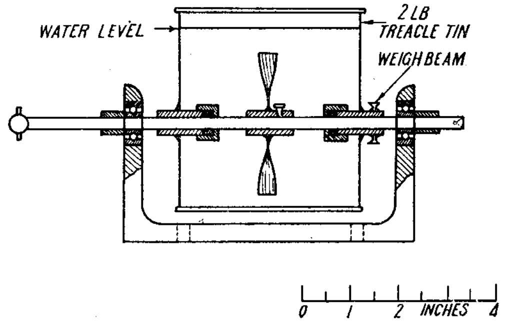



*Fig.* 8. *Paddle-wheel type brake*

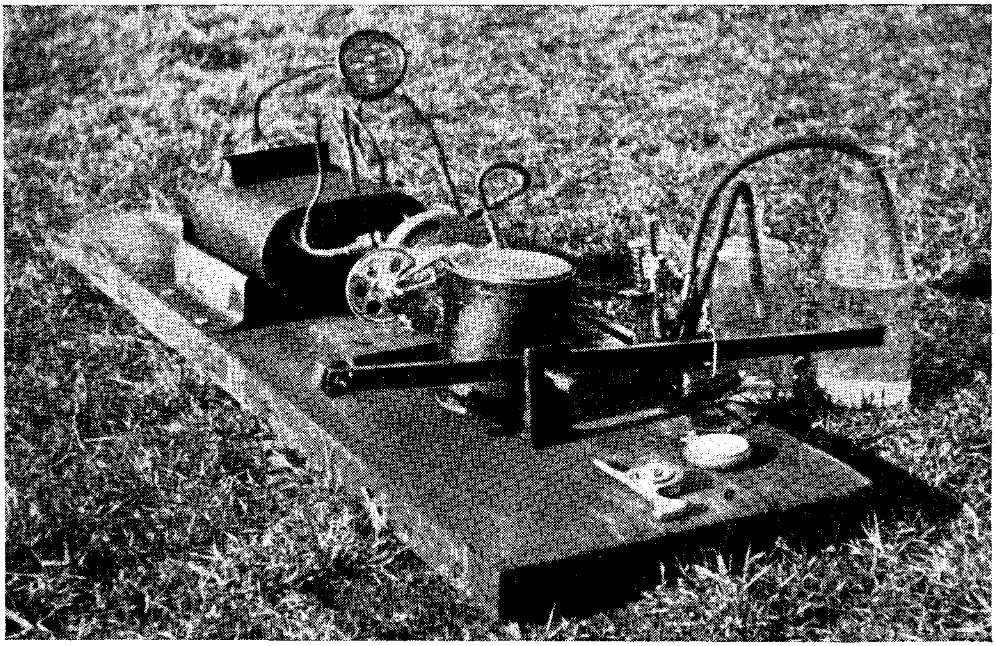
After the plant had been running for about 10 sec., I noticed that the pipe going to the steam nozzle was bright red. I was just about to shut down when the nipple blew off with a fearful roar. The force of the escaping steam bent the steam pipe at right-angles (jet propulsion). The pipe was re-brazed into the nipple and another start made with more water being fed in. This produced 0.254 b.h.p. at 37,000 r.p.m. Just after I had taken these readings, there was a fearful shriek and everything stopped suddenly. I had visions of a wheel without blades, but examination showed that the brake shaft had seized in its bushes. I had made both shaft and bushes from brass to avoid rusting, but had jumped out of the frying pan into the fire. However, I made a new shaft from silver-steel and all was well.

The next run produced 0.315 b.h.p. at 47,800 r.p.m., this again was due to pumping up the blowlamp to a higher pressure. Several more runs were done at the same setting, less b.h.p. being recorded on each occasion. This was finally traced to the blowlamp jets blocking up. I cleared these, and was able to reproduce the previous results. On this run I noticed petrol spraying out of the blowlamp container. I shut down just in time to avert a first-class fire, and found the Primus body covered with fine cracks. I scrapped it at once and a friend gave me another.

I did a lot of experiments on nozzles, altering the throat size and length of divergence. I tried a nozzle giving only 2 : 1 pressure ratio; this was an attempt to put the nozzle efficiency up. However, this produced inferior results because the pressure in the boiler was reduced, and steam formed in the coils earlier, cutting down the heat transfer rate and thus ruining the boiler performance.

The nozzle finally arrived at had a 0.037 in. throat and a divergent portion only 0.075 in.

(*Continued on page* 512)



*Photograph No.* 5. *Set-up for brake test and water consumption*

# Model Power Boat News

by " Meridian "

THE close of the 1951 regatta season was marked by the holding of the last two inter-club events late in September.

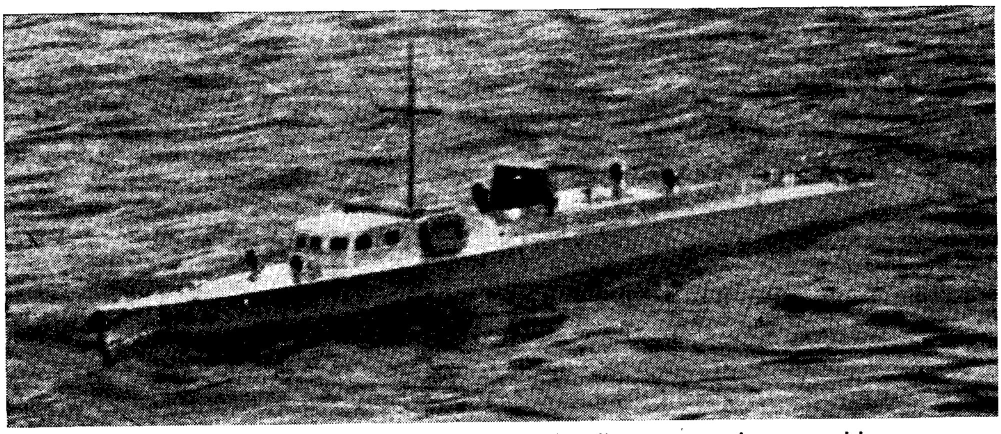
In former times the Grand Regatta was always the final event, but due to the huge fixture list in recent years, there are still one or two fixtures to be held later in the year.

As in 1950, records have been broken by the large number of entries at nearly all the regattas, and speed records, too, have been broken by the racing boats. The records in all the main classes are now over 60 m.p.h. and it is interesting to note that all records claimed have been achieved with silencers fitted. The surface propeller is practically universal, and speeds are gradually approaching those claimed by our American friends, as the possibilities of surfacing hydroplanes are experimented with and exploited.

The high speeds of the leading boats should not, however, deter the newcomer from attempting to build a racing boat. It should be remembered that very few " crack " boats can repeat sensational performances at every attempt. Events are quite often won at moderate speeds, due to the favourites failing to perform well, or maybe capsizing, and then the not-so-fast, but perhaps more reliable, craft come into their own.

Above all, let no beginner be afraid to run his boat in competition because he feels outclassed. Model power boat men are very understanding, and most of them have been through the mill at some time or other. A good example of this is Mr. E. Clark, who has been building and running racing boats for well over 20 years, and only this year has he been able to claim a record in Class " A " with his boat *Gordon* 2.

There is always the chance that a design will turn out to be a record-breaker, and to those builders of engines who never use their products, here is a plea : Don't put your engines in a glass case or on the shelf—put them in a boat and " have a go " !



*Mr. A. Squires' " Comet III," winner of the Kingsmere steering competition*

**The Kingsmere M.P.B.C. Regatta**

This club, although unable to use the Kingsmere lake for ordinary running, were able to obtain permission to use it for a regatta, and a fine turn-out of boats and competitors gave full support.

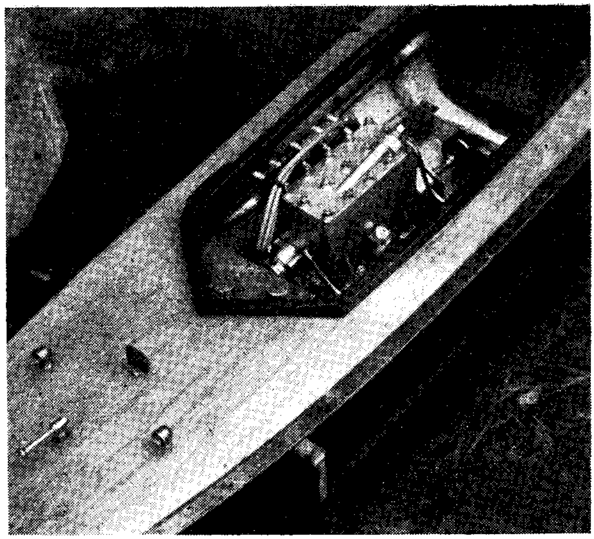
The proceedings opened with a nomination race for the straight runners, and the course was given as 90 yards. Some of the competitors thought that it was much less and after discussion it was left to the competitors to estimate the distance when making their nominations.

The winner was A. Rayman (Blackheath) with *Yvonne*, who had only 0.2 sec. error.

The racing boats had, as an addition to the normal programme, a 1,000 yard race, which was run concurrently with the races in each class, and this was won at the high speed of 61.2 m.p.h. by E. Clark's *Gordon* 3 (Victoria).

Very good speeds were recorded in all of the racing events, with the exception of the " B " class boats, which seemed to have a jinx on them. There was only one finished in this race—F. Jutton's *Vesta* 2, which did 38.7 m.p.h. on the best run. G. Lines' *Sparky* 2 suffered severe damage when the piston seized upon starting up, and several other boats also failed to run.

The winner of the steering contest was Mr. A. Squires, with his fine steamer *Comet III*, and it



*The 30-c.c. "Seal Major" four-cylinder engine of Mr. J. B. Skingley's "Josephine"*

is nice to see this boat in action again after a fairly long absence from regattas.

**Results**

| *Nomination Race* | Error per cent. |
|---|---|
| (1) A. Rayman (Blackheath) *Yvonne* .. | 1.66 |
| (2) J. Benson (Blackheath) *Comet* .. | 6.51 |
| (3) E. Walker (Kingsmere) *Coron* .. | 10.6 |

| 500 *yard Class "D" Race* | m.p.h. |
|---|---|
| (1) M. Hyder (Victoria) *Slipper I* .. | 47.51 |
| (2) E. Woodley (Enfield) *Christine* .. | 39.42 |
| (3) F. Walton (Kingsmere) *Jolt* .. | 22.71 |

| 500 *yard Class "C" Race* | m.p.h. |
|---|---|
| (1) L. Pinder (Kingsmere) *Rednip* 7 .. | 52.44 |
| (2) C. Stanworth (Bournville) *Mephisto* 2 | 51.04 |
| (3) R. Phillips (S. London) *Foz* 2 .. | 49.89 |

| 500 *yard "C" Restricted Race* | m.p.h. |
|---|---|
| (1) G. Stone (Kingsmere) *Lady Babs* 2 | 54.4 |
| (2) C. Stanworth Sen. (Bournville) *May* | 47.56 |
| (3) N. Butcher (Victoria) *Day-zee* 2 .. | 46.5 |

| 500 *yard Class "B" Race* | m.p.h. |
|---|---|
| (1) F. Jutton (Guildford) *Vesta* 2 .. | 38.59 |

| *Steering Competition* | Points |
|---|---|
| (1) A. Squires (Kingsmere) .. .. | 11 |
| (2) A. Clay (Blackheath) .. .. | 9 + 5 |
| (3) J. Benson (Blackheath) .. .. | 9 + 1 |

| 500 *yard Class "A" Race* | m.p.h. |
|---|---|
| (1) E. Clark (Victoria) *Gordon* 3 .. | 58.78 |
| (2) E. Walker (Kingsmere) *Boxotrix* .. | 53.83 |
| (3) B. Miles (Kingsmere) *Typhoon* .. | 43.52 |

| 1,000 *yard "All Comers" Event* | m.p.h. |
|---|---|
| (1) E. Clark (Victoria) *Gordon* 3 .. | 61.2 |
| (2) L. Pinder (Kingsmere) *Rednip* 7 .. | 58.44 |

**S. London Open Regatta**

This regatta was held in collaboration with the Lambeth Borough Council as a special "Festival of Britain" event, and, as the last open regatta of the season, it attracted a fine attendance. A special event was the "Daisy Rowland" Trophy open to all racing boats, the distance being 2,000 yards! Needless to say, few boats could manage 20 laps, but it was something of a surprise when the winner was F. Walton's *Jolt* 2, a 10 c.c. (Class "C") boat, which just managed to beat J. Innocent's *Betty*, the favourite for this "marathon" race.

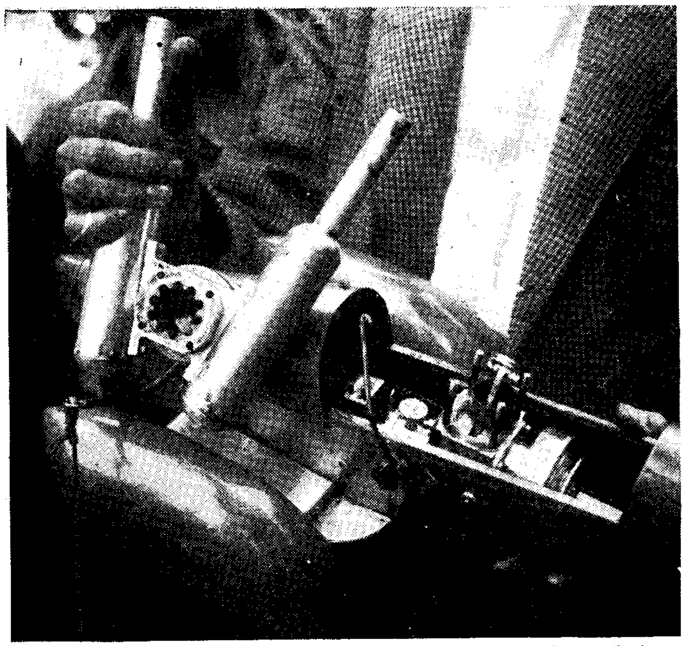
All the speed events produced some very good speeds, and in the Class "A" race, G. Lines (Orpington), with his new 30-c.c. boat *Big Sparky* won the event at nearly 60 m.p.h., a fine effort for a new boat. This performance was on a re-run after both *Big Sparky* and E. Clark's *Gordon* 3 had tied at 57.46 m.p.h. The Class "B" race was won by one of the long distance travellers—T. Dalziel, of the Bournville club, and in the Class "C" (Restricted) event there was quite a duel between L. Pinder's *Rednip* 8 and G. Stone's *Bill Barnes*, the latter bettering the 60 m.p.h. on the second run to win the race.

B. Miles (Kingsmere), with *Dragonfly* 2, made a fine run at 58.1 m.p.h., to win the Class "C" race. This is the best regatta performance to date with this boat. The straight-running events were last on the programme, but went off very well. Mr. J. Thomas (Blackheath) pulled off a double, by winning both the Nomination and Steering events. In the Nomination race both Mr. Thomas and Mr. Skingley (Victoria)

*Mr. Walton (Kingsmere) starting "Jolt 2"*

returned an exact nomination, so both boats re-ran the course and this time Mr. Thomas was 0.3 sec. out to Mr. Skingley's 2 sec.

The total entry for the regatta was about 50 different craft, and all London clubs were represented, besides Coventry and Bournville.



*"Sparky's" engine dismantled to show damage to cylinder and piston after a crack-up at Kingsmere*

**Results**

*500 yard Class "C" Race*

| | m.p.h. |
|---|---|
| (1) B. Miles (Kingsmere) *Dragonfly* 2 | 56.1 |
| (2) L. Pinder (Kingsmere) *Rednip* 7 .. | 51.1 |
| (3) Mr. Collier (Coventry) .. .. | 48.7 |

*500 yard "C" Restricted Race*

| | m.p.h. |
|---|---|
| (1) G. Stone (Kingsmere) *Bill Barnes* | 61.99 |
| (2) L. Pinder (S. London) *Rednip* 8 | 58.44 |
| (3) C. Stanworth Sen. (Bournville) *May* | 44.4 |

*500 yard Class "B" Race*

| | m.p.h. |
|---|---|
| (1) T. Dalziel (Bournville) *Naiad* 2 .. | 46.49 |
| (2) F. Jutton (Guildford) *Vesta* 2 .. | 40.2 |
| (3) N. Hodges (Orpington) *Sparta* .. | 26.24 |

*500 yard Class "A" Race*

| | m.p.h. |
|---|---|
| (1) G. Lines (Orpington) *Big Sparky* .. | 59.81 |
| (2) E. Clark (Victoria) *Gordon* 3 .. | 57.46 |
| (3) E. Walker (Kingsmere) *Boxotrix* .. | 50.13 |

*500 yard Class "D" Race*

| | m.p.h. |
|---|---|
| (1) Mr. Hyder (Victoria) *Slipper I* .. | 48.7 |
| (2) Mr. Woodley (Enfield) *Christine* .. | 42.6 |

*"Daisy Rowland" Trophy 2,000 yards*

| | m.p.h. |
|---|---|
| (1) F. Walton (Kingsmere) *Jolt* 2 .. | 32.2 |
| (2) J. Innocent (Victoria) *Betty* .. .. | 32 |

*Steering Competition*

| | Points |
|---|---|
| (1) J. Thomas (Blackheath) *Rose* .. | 10 |
| (2) E. Walker (Kingsmere) *Coron* .. | 9 |
| (3) A. Newcombe (Victoria) *Silver Foam* | 8 |

*Nomination Race 50 yards*

| | Error sec. | |
|---|---|---|
| (1) J. Thomas (Blackheath) *Rose* .. | 0.2 | after tie |
| (2) J. Skingley (Victoria) *Josephine* | 2 | |
| (3) A. Clay (Blackheath) *Elizabeth* | 1 | |

# An Experimental Steam Turbine

(*Continued from page* 509)

long. The exit was turned away as thin as possible to minimise wall interference on the jet. The dimensions are given in Fig. 6. A run with this nozzle and the new blowlamp container resulted in a reading of 0.47 b.h.p. at 60,000 r.p.m., with a water consumption of 0.45 pints per min.

I now decided to make a mechanical petrol pump, as I did not like to put any more pressure on the Primus body. A check on the fuel consumption showed I wanted a pump of about $\frac{1}{8}$ in. bore by $\frac{1}{4}$ in. stroke. This was also made with variable stroke, and driven from the back end of the water pump crankshaft. The first run with this just gave me time to record 0.5 b.h.p. at 62,000 r.p.m. before the blowlamp went out. I stripped the pump, expecting to find a piece of dirt under a valve, but all was well. I tried again and got the same results; this was repeated several times before I tumbled to the cause. The fuel pump body was attached to the turbine casing by a dural block, and this conducted heat to the pump and vapour locked the system. I realised that a fibre block would cure this, and I stripped the turbine down to fit it. While it was dismantled I polished it up and mounted it on a mahogany stand, for my club exhibition. It looked so nice, to me anyway, that I have not since had the heart to run it and get it all dirty. However, the project is not dead and new ideas are beginning to form. I have not considered it powerful enough to warrant installing it in a hull, because i.c. engines in the same class develop well over 1 b.h.p.

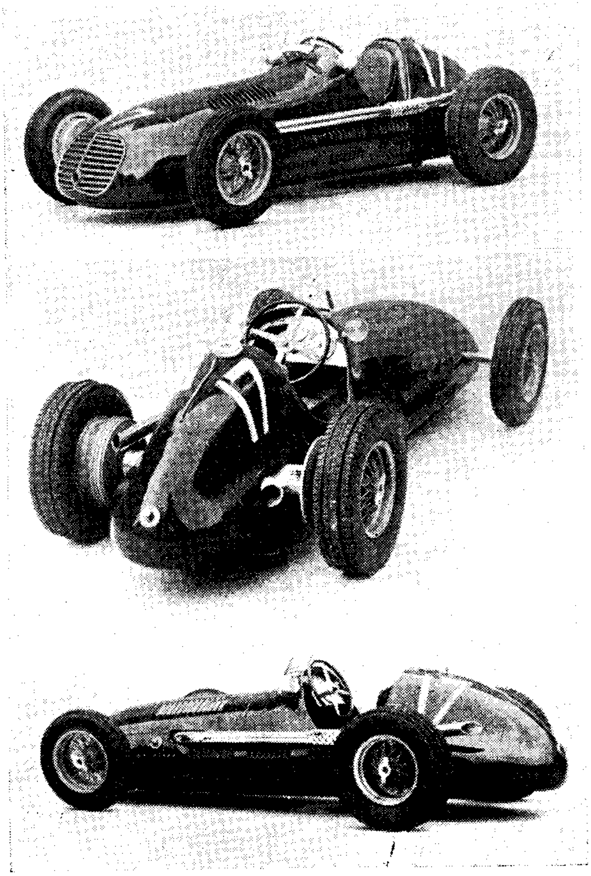
# *MINIATURE GRAND PRIX RACING

## by G. W. Arthur-Brand

LAST week you were introduced briefly, to the new sport of Miniature Grand Prix racing. Now I propose to tell you something about the cars and the rules for their running, as laid down by the Miniature Road Racing Association.

A glance at the first illustration will enable you to grasp the essential features of the ideal model, which is one of Mr Baigent's delightful replicas of the 4 CLT Maserati. This particular car was built for r.t.p. running, but it is identical with the ones to which rail guides are fitted.

Now, let us examine the rules so that we may form an early impression of the requirements.



*Three views of one of Mr. N. C. Baigent's Maseratis, the ideal type of model for miniature Grand Prix racing*

(1) *Engine.* This may be either c.i. or i.c., with a maximum capacity not exceeding 1.5 c.c.

(2) *Transmission.* May be either geared or direct, but the final drive *must* be through a clutch.

(3) *Starting.* Provision must be made to enable engines to be started, either by mechanical starter or by hand, without dismantling any part of the car.

(4) *Wheels.* All cars must be fitted with four wheels, the tyre-sizes of which must not exceed 2¾ in. outside diameter.

(5) *Body.* This must conform to a known prototype. Should a remote model be copied, photographs of the original must be available for scrutiny on request.

(6) *Attachment.* The attachment of cars to the rails must be by a fitting of the standard design as made and supplied by the patentees.

(7) *Rail.* Bar or tube, of an overall diameter of $\frac{5}{16}$ in.

(8) *Spacers.* Overall height 0.150 in. plus or minus 0.010 in.

(9) *Guide Rollers.* As supplied by patentees.

(10) *Corners.* The radius of any corner curve or bend must not be less than 3 ft.

With the above clearly fixed in our mind's eye, we can now forge ahead and consider the development of a suitable car.

For the sake of simplicity, and in consideration of minimum all-up weight, it would be difficult to improve on Mr. Baigent's design, which consists in the main of an undershield, to which are fitted engine, wheels and track gear, and a beaten alloy or carved wooden body to taste or pocket, as the case may be. I have little doubt, however, that many readers will want to construct really detailed models, incorporating such refinements as correctly detailed chassis, independent suspension and, perhaps, even multi-cylinder engines. Whatever you have in mind, remember that in this type of racing the governing factor is reliability, and this not only means reliability of engine, but, too, a method of construction which will ensure that the car remains in one piece indefinitely. One big consolation appears to be that, within reason, all-up

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**Continued from page* 480, *" M.E.," October* 11, 1951.

weight is not greatly important. Note, of course, that I said *within reason*. As track development progresses, it is obvious that a different set of conditions will present themselves on each circuit, and on those incorporating long, steep gradients, with perhaps a hairpin at the bottom, obviously the car with the most suitable gear ratio will score.

The cars at present in operation are of either

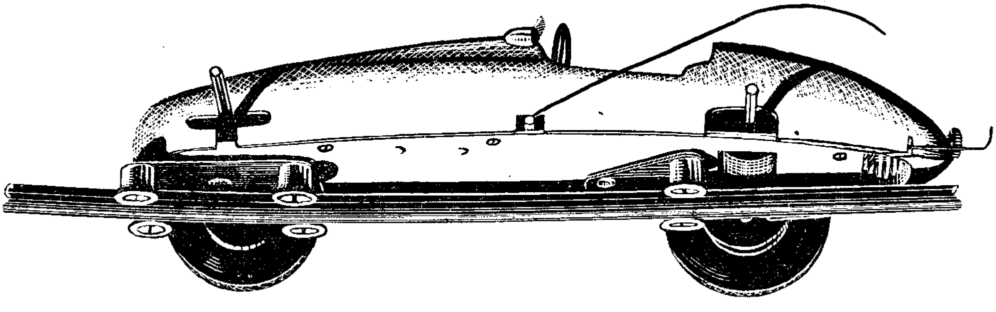


*Fig.* 1

1 in.-1 ft. or ¾ in.-1 ft. scale, for 1½ and 0.75 c.c. engines respectively, and these sizes appear to be ideal, allowing ample interior space for power accommodation.

Rail resistance is practically nil, except on tight bends, and in this connection I feel that some form of suspension for the guides may be beneficial. Also, the present method of steering, by central pivoting of the front axle, could be improved upon quite simply. Instead of leading the axle through the forward guides' vertical extension, a single projecting arm could be used

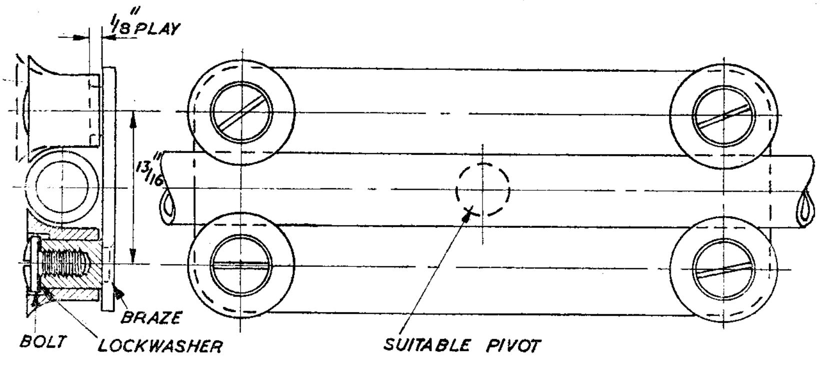



*Fig.* 2

to operate the track rod of an Ackerman assembly. But these are questions which only the individual operator can answer at present ; so, for the purpose of this article, we will stick to the very successful method currently employed. Fig. 1 makes the attachment quite clear, while Figs. 2, 3 and 4 show the actual construction of the guides, both front and rear. The second photograph shows how the front axle swings with the forward guides as the car goes into a bend.

Now let us examine the question of power and transmission. What are the requirements? Clearly, maximum output as near the starting gate as possible, coupled with a comfortable rate of revs. and reasonable flexibility. Additionally, the engine must be capable of fairly long periods of running at a standstill without showing signs of distress, as when the cars are being started and brought to the starting line to await the starter's flag. For all these conditions to exist in a perfect combination the transmission must not only be of adequate design, but its adjustment, installation and maintenance must be as nearly flawless as is humanly possible. All of which adds to the fun of the game and makes it really worthwhile.

The direct drive *versus* geared theory has been well discussed amongst the experts, and I have a feeling that there is still a concensus of opinion regarding the pros and cons, but I don't think, personally, that there can be the least doubt that the geared variety will come out tops in the long run. Looking well ahead, I will go so far as to say that, not only should gears be used, but provision also be made for a change of ratio, say, from 1.5-1 to 2-1, with some alternatives between these ratios to suit the engine and the nature of the circuit. The question undoubtedly is—how can this be done most easily? And the answer is, of course, use spur gears. By employing a simple type of engine bearer

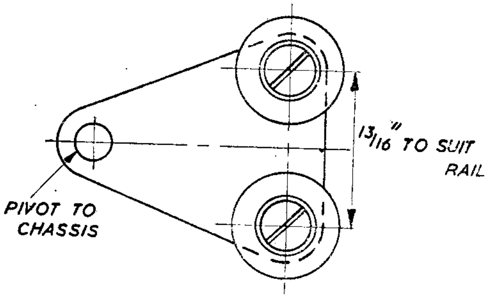



*Fig.* 3

which will allow the engine to be adjusted longitudinally, a change of ratio could be affected in well under two minutes—with practice, of course!

For the bevel drive adherents (assuming that you can find a plant small enough to fit beneath the cowl) a change of gears would be a somewhat more tedious operation, but it can be done!

However, I won't go further into it at the moment, since, as I said before, all this is looking some little way ahead, and we will cross our bridges as they heave in sight. In the meantime, should you come across that midget motor, by all means carry on with your bevel drive and tell me about it; I shall be very interested.

In my next instalment, I shall touch on track construction, and you will undoubtedly be pleased to hear in advance that, although they offer a far greater range of possibilities than the old r.t.p. tracks, they are but a fraction of the

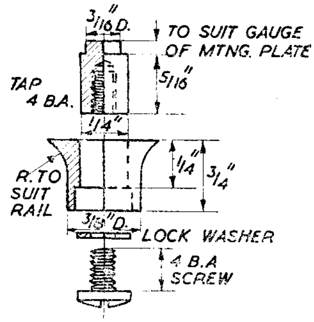
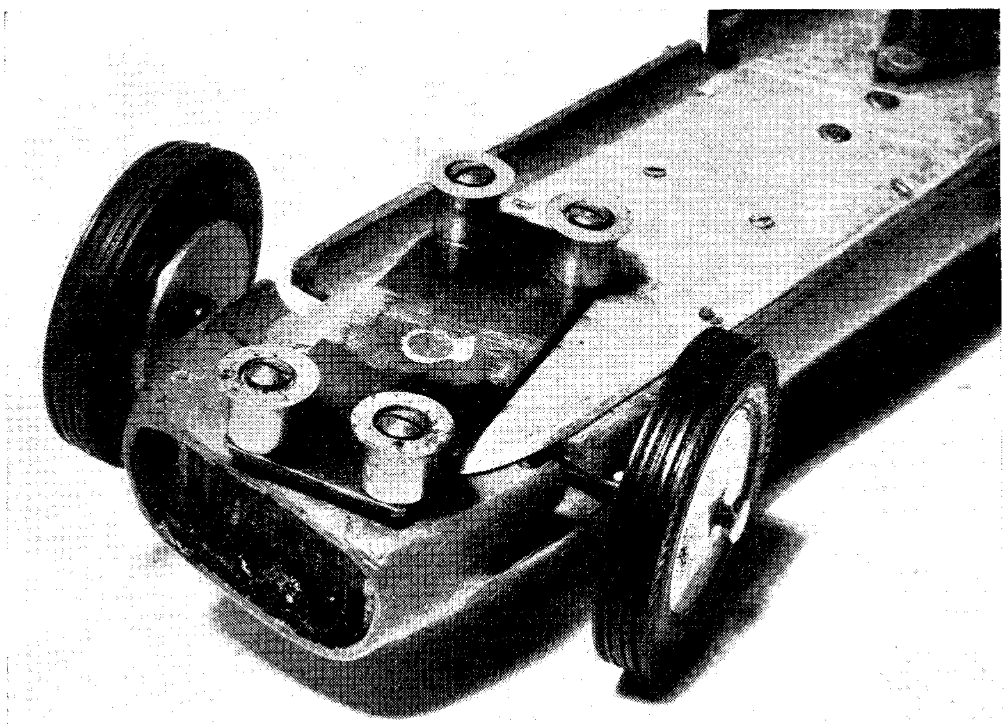



*Fig.* 4

cost to build and can be stowed in a compact space between meetings. In the meantime, should there be any queries relating to the building or running of miniature G.P. cars, I shall be delighted to hear from you.

(*To be continued*)

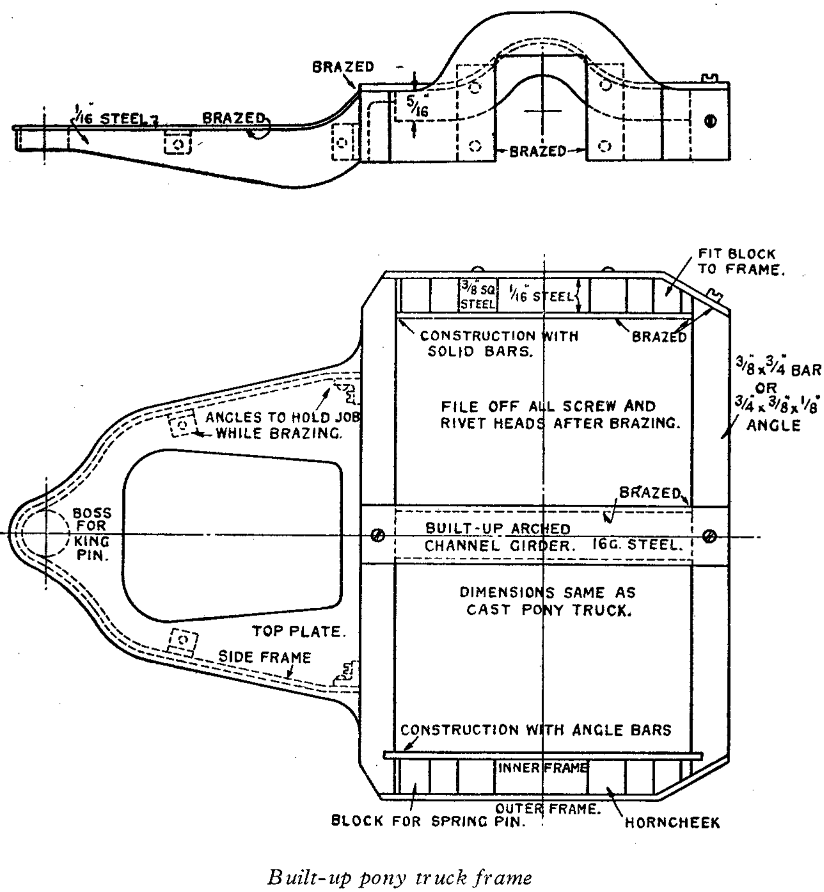


*The forward steering attachment on a* 0.75 *c.c. B.R.M.*

# "Britannia" in $3\frac{1}{2}$-in. Gauge

## by "L.B.S.C."

As previously mentioned, the full-size "class sevens" have fabricated pony-truck frames, and it was my original intention to build up the frame on my own engine; but after receiving the sample casting, described in the previous instalment, I used it to save time. The latter is to record that "Bro. Reevesco" called here on the afternoon of September 4th last, and brought a very clean aluminium casting of the pony-truck frame. Whilst this is lighter, naturally, than iron or bronze, it is quite suitable for the job, being more than strong enough to with-




*Built-up pony truck frame*

now my most precious commodity; very little left, and so much to do. As there are probably many builders of little *Britannia* who would prefer the built-up job, having both the time and energy, here is a simple way of doing it. The arrangement of axleboxes, roller-bearings for the side movement, and other details, will be common to either the cast or built-up frame. Whilst mentioning castings, it may be of interest stand the stress of carrying the rear end of the engine. Bronze axleboxes can be used for either plain or ball-bearing axles; cast-iron boxes would also do, and ball-bearings could even be housed in aluminium boxes, at a pinch. A thin steel plate would be required, along the top of the rear cross-member, on which the rollers at the bottom of the bearing brackets could run, as the rollers would cause rapid wear of the soft metal;

and it would be advisable to bush the hole for the king-pin. Otherwise, there is, as the classics say, nothing in it, the reduction in weight being negligible.

Incidentally, if there are any doubting Thomases, Bills, Dicks or Harrys in the Birmingham area who still don't believe that I make the drawings that are reproduced in these notes, and actually design *and build* locomotives that do all I claim, or how my injectors feed without knocking the steam gauge back, let them call in at Moseley Road for an eye-witness-personal-experience account of what took place during the afternoon and evening of the date mentioned. Mr. Reeves was accompanied by Mr. A. R. Donaldson, the Ashford draughtsman who traces and blueprints the before-mentioned drawings for sale at the offices of this journal, and by our approved advertisers. The pair of them were running my engines until long after dark, and it was nearly 10 p.m. ere they departed per "Morris special" for the $55\frac{1}{2}$ miles non-stop run to Ashford.

### No Special Sections Needed

The whole doings can be made up from the kind of material usually found in home workshops; short ends of rod, bar and angle, and odd bits of sheet steel. A one-pint blowlamp, or a small air-gas blowpipe of equivalent power, will do the brazing; if an oxy-acetylene blowpipe is available, the job is easier than soft-soldering. First of all, cut out four plates from $\frac{1}{16}$-in. or 16-gauge steel sheet (bright or blue, doesn't matter which, as long as they are flat) by same method used for main and bogie frames. The ends of these are bent over as shown in the plan, a job easily done in the bench vice. Don't hit the metal with the hammer, but hold a bit of hard wood against it, and hit that instead, so that the metal will bend without being marked. Also don't forget you need one pair right-handed and one pair left-handed. No horncheeks are required; their place is taken by the pieces of bar which act as spacers, and hold each pair of plates together. They are 1-in. lengths of $\frac{3}{8}$-in. square steel, placed at each side of the axlebox opening, flush with same. Hold the lot together by aid of a toolmakers' cramp; drill a couple of No. 41 holes clean through plates and bar, and secure temporarily by 3/32-in. iron rivets, or bits of iron wire, riveted over at both ends, would do, as the bars are brazed up along with the frame assembly. Also fit two bits of $\frac{1}{4}$ in. $\times$ $\frac{5}{16}$ in. steel, for the spring-pin blocks, as shown in the illustrations.

### The Rectangular Part

The side frames are connected at back and front, either by two pieces of $\frac{3}{8}$ in. $\times$ $\frac{3}{4}$ in. mild-steel bar, or $\frac{3}{8}$ in. $\times$ $\frac{3}{4}$ in. $\times$ $\frac{1}{8}$ in. angle steel, just as you prefer, or whichever is available. These pieces should be $5\frac{3}{8}$ in. long for the front one, and $5\frac{1}{8}$ in. for the back. Bevel the ends, as shown in the plan view; and if bar is used, attach the side frames to them, by a couple of 3/32-in. steel screws (any head will do) put through clearing holes in the frame plates, into tapped holes in the bevelled-off ends of the bars. If angle is used, a minor version of the way the main frames are fixed to the buffer-beam, will do the trick easily. Leave the inner frame plates $\frac{1}{8}$ in. longer at each end, and make slots in the top of the angle, into which the frame plates can be tightly driven. That will hold the pieces together whilst the brazing operation is in progress.

The arched merchant in the middle, which reminds me of a cat on the warpath, should, by the good rights, be made from a piece of $\frac{1}{2}$ in. $\times$ $\frac{5}{8}$ in. $\times$ $\frac{1}{16}$ in. channel steel, but the average locomotive builder would have no end of a job in bending it to the shape of the militant moggy's back. I have a machine that would think nothing of it, to wit, a Diacro rod, tube, angle and channel bender, which bears a strong resemblance to the top part of the controllers which used to adorn the end platforms of our defunct and unmourned street tramway cars; but without such aid, it would be an easier job to build up the channel. This is just as easy, as the bending would be difficult. All you have to do, is to cut out the sides, to the shape shown, from a piece of 16-gauge sheet steel; then cut another strip $\frac{5}{8}$ in. wide, and bend it to the arch shape of the upper edge of the side pieces. Allow an extra $\frac{3}{8}$ in. at each end, for the attachment to the front and back members. Tie the top to the sides, with some thin iron binding-wire, and braze the joints. Simply apply a fillet of wet flux (Boron compo or similar) along the inside of the joint at each side, blow to a bright red, and feed in some soft brass wire about $\frac{1}{16}$ in thick; or $\frac{1}{16}$-in. Sifbronze rod can be used. This will melt and form a fillet for the full length of the joint. Let cool to black, quench in water, pull off the iron binding-wire, remove any superfluous knobs and excrescences with a file, and there is the arched channel girder, all-present-and-correct-sergeant. Attach it to the middle of the rectangular framework by a 3/32-in. screw at each end.

### Front Section

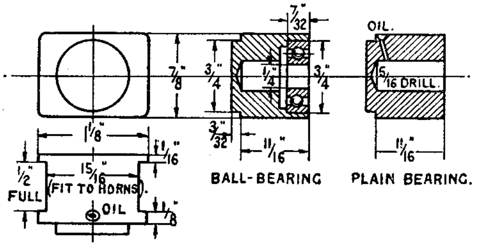
The top part of the front section is made from a piece of 16-gauge sheet steel, cut to the shape shown in the plan, and bent up in a curve at the rear or wider end. The bend can be made in the bench vice, by clamping the metal in the jaws, with a piece of 1-in. round bar beside it. Bend it over the bar, to a little more than the required amount; it will spring back a little, and settle itself at the correct radius. The hole can be cut with a piercing saw, or by the usual method of drilling holes all around inside the marked line, breaking out the piece, and filing to outline.

The sides can be cut from 16-gauge steel sheet, the approximate length of the strips required being obtained by running a bit of soft wire along the edges of the top part, and straightening it out afterwards. They need not go right around the end, but can finish at the sides of the boss through which the king-pin passes. This boss is a $\frac{3}{16}$-in. slice of $\frac{1}{2}$-in. round rod, temporarily attached to the top part of the pony truck frame by a 3/32-in. iron rivet. The sides can be attached to the top, by a couple of $\frac{1}{4}$-in. angles, as shown, which may be bent up from any odd bits of $\frac{1}{16}$-in. steel that may be suitable, and riveted to both top and sides by 3/32-in. iron rivets. These pieces of angle are merely to hold the parts together during the

brazing process. The whole front section may then be attached to the rear rectangular section by a similar piece of angle at each end, riveted to the sides, and screwed to the front girder if a bar, or riveted to it, if made from angle.

### How to Braze the Assembly

Lay the whole issue upside down, in a pan of small coke or blacksmith's breeze. Mix up some Boron compo, or any good brazing flux, to a creamy paste with water, and lay a thick fillet all along the joints—around the front boss,



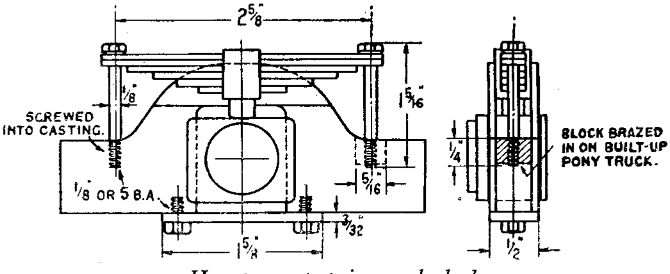

*Pony axleboxes*

along joints between top of front part and sides, along the joint where the front part contacts with the front girder of the rear portion, at the corners of the rectangle where the side frames join the front and rear girders, along the pieces of square rod between the inner and outer frame plates, and over the joints where the centre girder touches the cross-members at front and rear. Make certain that nothing is loose, to shift or twist when the whole lot is red-hot, or there might be a few words of equal temperature to add to the dictionary of railroad Esperanto. Then get busy with your blowlamp. The best brazing material to use for a job like this, is soft brass wire of about 16-gauge. Easy-running brazing strip may have a tendency to run *too* easily, and flow all over the steel at the slightest provocation, leaving a nice old mess to file away, in order to make the job look respectable. If you use the brass wire, you can coil it up, leaving about a foot straight; hold the coil in your hand, and feed the straight end to the red-hot metal. When some of it has melted off into the joint, uncoil a bit more, and ditto repeato until the whole job is done. Always aim for neatness in any fabricated work; it pays to use care.

As to the actual " technique," first heat the whole evenly, until all the moisture has dried out of the flux, and left same sticking to the joints, and looking kind of fluffy. Concentrate the flame on the boss, and when that is bright red, touch it with the brass wire, having previously dipped the end in dry flux. A bit will immediately melt off, and flash around the boss in an even fillet. If it doesn't, you haven't enough heat; if you get a green flame with white smoke, you have too much heat, and the brass wire will burn, the zinc in it causing the smoke and flame. Then proceed in much the same manner as I described for boiler brazing. Go along both side joints, and when you arrive at the rectangular part of the frame, play the flame on the corners, and see that the melted brass runs well in, making fillets on the inside. Then go right along the joint where the curved top of the front part joins the front girder, giving the front end of the pussy-back girder a dose at the same time, so that it is properly attached to the front girder. Next, do both corners of the back girder, where it is attached to the side plates, also the rear end of the pussy-back. Finally, apply the flame to the axlebox openings, and run the molten brass down each side of the pieces of $\frac{3}{8}$-in. square rod which form the connections between inner and outer frame plates, also the spring-pin blocks. Make quite sure you have not missed anything; let cool to black, and quench in clean cold water. Knock off any burnt flux with an old file that has outlived its normal spell of duty; and if any brass has settled on any spot where it should not be, file it away, also all the rivet and screw heads. The complete frame can then be given a coat of black paint; any good hard-drying enamel will do. I have recently been trying " Valspar," to see if it stands up to heat and oil, and so far it has behaved very well; one reason why I tried it, was that it dries hard in four hours. I've no shares in the company; a friend sent me some to try, and that's all there is to it. I've had excellent results with Manders' hard gloss paint and lacquer, also with " Sol," and other well-known brands, but they take longer to dry hard.

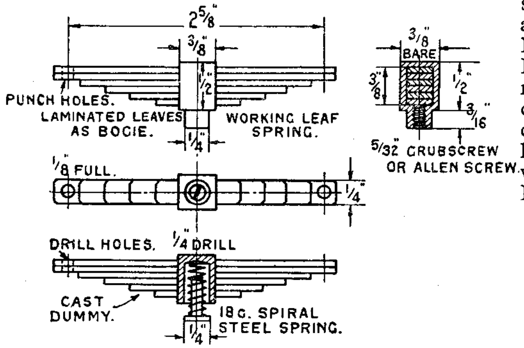
### Axleboxes and Springs

As with the bogie, the axleboxes may have either plain or ball-bearings, or needle-bearings; my own engine has the latter. All the dimensions are shown in the drawings; and as the method of construction is pretty much the same as given for the bogie, it isn't necessary to waste space with repetition. The boxes should be a nice sliding fit on the horns, and just free enough on the flanges, to enable them to tilt sideways a wee bit, when the engine runs over an uneven road. From what some of the lads of the villages tell me, some of the club tracks are getting into a state where a locomotive travelling at any speed, emulates a steamship in a rough sea, except that it cannot sink. If I might give them a tip, much of it is due to concentrating too much load on too few axles. I recollect once,



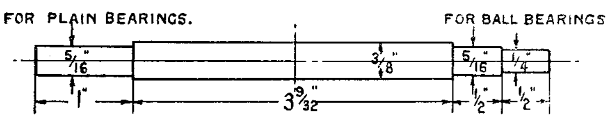

*How to erect spring and alexbox*

a member of a club less than a hundred miles away, showed me a flat car he had built, to carry three adults or four kiddies. It had only four wheels. When I asked him why he used only four wheels, he said that it would stay on the road better than a bogie car. This concentration of load was enough to cause small-section rails to




*Pony springs*

bend down between sleepers ; nothing less than continuous support, preferably on concrete, would stand up to it. I have already related how an adult passenger on a four-wheel car, finished off a couple of weak longitudinal timbers on my own road. I found that spreading of rails, and loosening of screws on my curves, has been

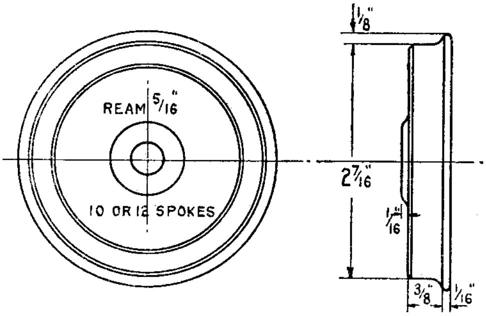



*Left—Pony axle*

caused by two passengers per car, going at a fair speed ; combined weight and centrifugal force has been responsible. As I now haven't the time to be continually tightening screws, fettling up joints, etc., the rule is now one adult passenger per eight wheels ; and I am shortening my cars, so that the load per axle cannot be exceeded. In any case, the weight of an average adult is equal on $3\frac{1}{2}$-in. gauge, to a load of 320 tons—approximately—and no locomotive and carriage superintendent in his right senses would put that weight on four axles ! Please excuse this digression, but I thought it advisable to set it down while fresh in mind.

The hornstays, or pedestal ties would be a better term in this case, are pieces of 3/32-in. strip steel, $\frac{1}{2}$ in. wide and $1\frac{5}{8}$ in. long, attached to the underside of the pony-truck frame by $\frac{1}{8}$-in. or 5-B.A. screws. The screws run through clearing holes in the stays, into tapped holes in the cast frame, or holes drilled and tapped to suit, in the $\frac{3}{8}$-in. square blocks in the built-up frame.

The springs may be either full working leaf-springs, as on my own engine—I love to see the leaf springs flexing, as in full-size, as the engine runs—or cast dummies, with spiral springs in the hoop or buckle. The method of making the working leaf-springs is exactly the same as detailed for the equaliser springs, so once more we can save time and space by omitting the detail. The holes in the top plates are plain round punchings. The spring pins are made from silver-steel, screwed at both ends. At the bottom, they screw into tapped holes, either in the casting, if one is used, or in small blocks of steel specially brazed in for them as shown in the part end view of a built-up frame. Nuts prevent the springs coming off the pins. Both cast dummy or real working leaf-springs are mounted in precisely the same manner ; the only difference is, that in the former, the bottom of the coil spring bears on the axlebox, whilst in the latter, the projection at the bottom of the hoop, which houses the clamp screw, does the needful. Incidentally, on the full-sized locomotives, the




*Pony wheels*

camber of the pony springs is reversed ; instead of the top plate either cambering upward, or being straight, under normal load, the ends droop down, as though the poor arabs were in the depths of despondency. I'm specifying straight springs for the little engine, as they are easier to make, and do the job efficiently. The straight springs on the pony truck of my *Tugboat Annie*—now known unofficially as "*Britannia's* little mum" —have carried the weight of her heavy trailing end for quite a number of years now, without showing any "signs of despair." They have always acted perfectly ; the pony truck does not derail at the highest safe speeds on the curves, the wheels following every deflection. The flanges make no attempt to climb the rail heads, even in the coldest weather, when the gaps between rail ends are wide open ; so *Britannia's* pony truck should be equally efficient.

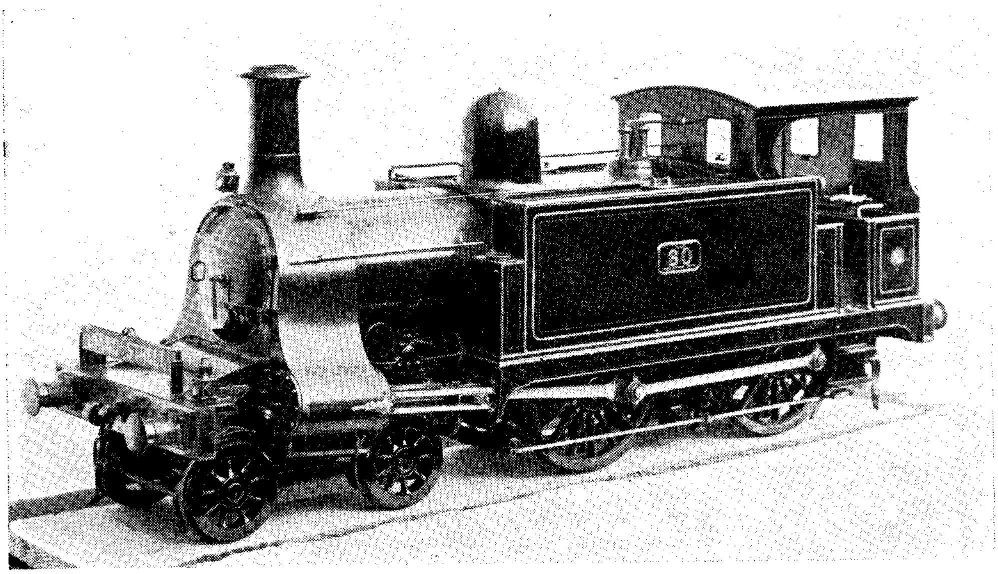
## Wheels and Axles

The wheels are $2\frac{7}{16}$ in. diameter on tread, and are turned in the same way as the bogie wheels, all dimensions being given in the drawing ; and while you are on the job, turn six more, exactly similar, for the tender. Whilst the lathe

is set for the job, and you have the dimensions fresh in mind, it takes very little longer to do the whole batch, and you reap the benefit later on.

The axles are turned from ⅜-in. round mild-steel; one for the pony truck and three for the tender. If the lathe has no hole, or only a small one, through the mandrel, turn the axles between centres, as previously described; otherwise, use the three-jaw. It doesn't matter if the chuck jaws are out of truth by a thousandth or two, because wheel seats and journals are turned at the same setting, and so must of necessity be true with each other. If ball or roller bearings are being used, extreme care should be taken to turn the journals an exact fit for them; on my own engine, I have used Torrington bearings, same as on my bogie. The size of the journals needed for plain boxes, are shown in the illustration; aim for the smoothest possible finish, to minimise wear, and ensure free running. As both pony and tender axleboxes are outside the wheels, all the latter may be pressed on to the axles right away, making certain that they run truly. Next stage, erection of pony truck.

# A WELL-KNOWN MODEL ON VIEW AGAIN



IN 1888, a beautiful ⅛ scale working steam model of the North London Railway 4-4-0 tank engine No. 60 was built at Bow Works. Complete in every detail, and one of the most perfect model locomotives ever made, it was shown at the Paris exhibition in the following year.

For many years this model stood at Broad Street station, headquarters of the North London Railway, and was duly connected to an electric motor installed in the base of its showcase, the insertion of a penny in the slot provided bringing the wheels into motion. During the last war it was removed to Crewe for safety.

The Public Relations and Publicity Officer of the London Midland Region has now had the model thoroughly overhauled and restored to Broad Street, its spiritual home, where it is expected that it will help to swell the funds of the Railway Benevolent Institution.

The model is finished in the later style of North London livery, namely, black with yellow, red and pale blue lines. It is embellished on each side with the correct coat of arms, and its equipment includes a full complement of detachable destination boards lettered "Broad Street," "Richmond," "High Barnet," "Potters Bar" and other places served by the railway.

The prototype of the model—No. 60—was built at Bow Works in 1888 (works No. 205) under Mr. J. C. Park's superintendence, and was one of a numerous North London class which was the first to be provided with cabs for the enginemen, although some earlier locomotives were given this improvement on rebuilding. Her two outside cylinders had a diameter of 17 in. and stroke of 24 in., the coupled wheels having a diameter of 5 ft. 5 in. The boiler pressure was 160 lb. per sq. in. and the weight 46 tons in working order, the fuel capacity being only 1½ tons of coal and 850 gallons of water.

No. 60 was rebuilt at Bow in 1904 (and given a new works number 307) and after the London & North Western Railway took over the North London on January 1st, 1922, she was renumbered 2852. She became L.M.S. No. 6491 in April, 1927, and was broken up at Crewe two years later.

# IN THE WORKSHOP

## by "Duplex"

### No. 100.—*Some Workshop Lighting Fittings

THERE can be no doubt that the proper lighting of machine tools is an essential matter in any workshop. If the lamp is suspended above the machine, the general workshop lighting, unless it is specially located, is apt to throw shadows just where the light is most wanted.

To overcome this difficulty, lighting fittings are sometimes attached directly to the machines themselves. An example in point is the simple attachment illustrated in Figs. 8 and 9. This fitting was devised for one of the drilling machines in our workshops to enable light to be thrown directly on the work. The attachment consists of a spring-loaded collar provided with a stirrup to hold a miniature reflector. The collar fits over the column of the drilling machine, and is free to slide or turn. A universal mounting is thus provided for the lampholder.

The amount of light required is not large and so can be met quite adequately by an Osram pygmy lamp of 15 watts rating. This bulb will fit directly into the small bayonet cap lamp holder that is supplied with the miniature reflectors provided for Terry anglepoise lamps.

The lamp bulb is completely protected by the reflector, and so can suffer no damage when in use. Moreover, the grip afforded to the collar by the springs seen in the illustrations, whilst sufficient to hold the lamp securely at all times, is not so strong as to prevent the device moving if accidentally knocked.

The lamp is connected by oil-proof and wear-resisting cable to a plug and socket mounted at the base of the drilling machine.

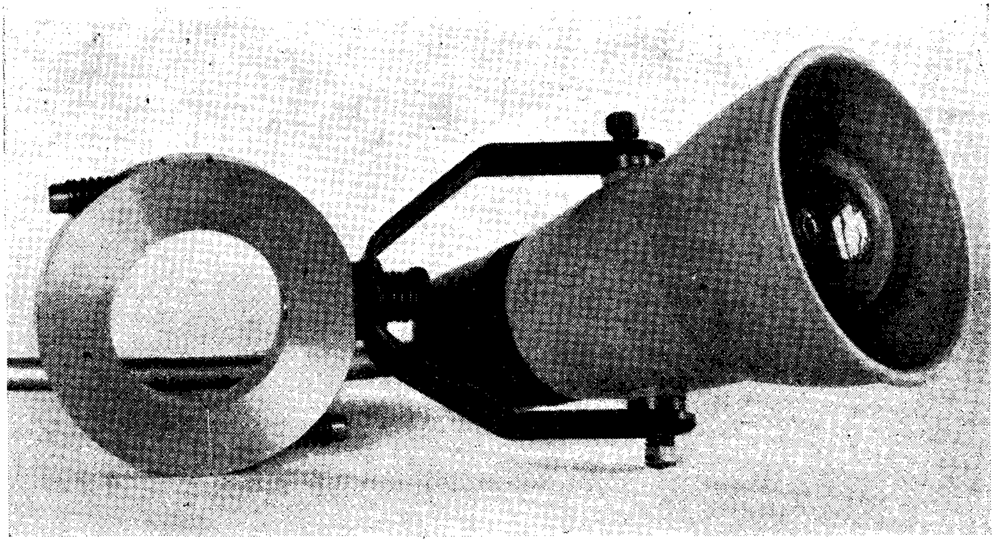


*Fig. 8. A simple lighting fitting for the drilling machine*

The details of the few simple parts comprising the device will be readily apparent from the illustrations, Figs. 10A and 10B. Instruction on machining the several pieces is not needed, since all the operations involved have been the subject of previous articles.

The methods for making the collar have been fully described in an article, published in THE MODEL ENGINEER on August 31st, 1950, and entitled "Shaft Collars." The split collar therein described is not sawn in half; in all other respects the collar to be used in this instance is made by the methods explained in the article.

The collar is best made from a light alloy, such as duralumin, but any convenient piece of brass or steel will serve equally well if aluminium alloy is not obtainable.

No details have been given of the screws and fittings for attaching the reflector to the bridle. As will be seen from the illustration, Fig. 8, the reflector is spring-loaded so as to remain in any desired position.

The bridle itself is also spring-loaded, as will

*Continued from page 444, "M.E.," October 4, 1951.

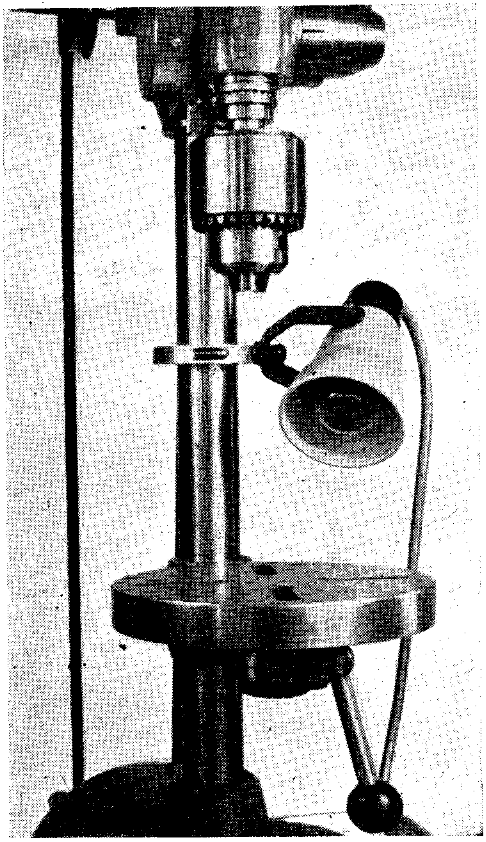


*Fig.* 9. *The lighting fitting attached to the drilling machine column*

be seen in the working drawings, Fig. 10, and turns on a shouldered stud. The spring is kept at the right tension by a shouldered 2-B.A. nut screwed hard against the end of the thread on the stud. The length of the threaded portion of the stud must, therefore, be adjusted by trial to ensure that the spring exerts sufficient pressure.

### The Miniature Anglepoise Lamp

Miniature anglepoise lamps, made by Messrs. Terry and from time to time advertised for sale in THE MODEL ENGINEER, will be found most useful for auxiliary lighting in the workshop. These lamps are designed for use in aircraft when connected to a 24-volt circuit, and are fitted with a small reflector and the type of small bayonet cap lamp holder, already referred to in connection with the drilling machine lighting attachment.

When the lamp is used for lighting a lathe, the 15-watt pigmy bulb, normally fitted, hardly gives sufficient light, but the illumination with this bulb is adequate for lighting the drilling machine. The lathe can, however, be well-lighted by fitting 36-watt bulbs and using a pair of anglepoise lamps.

By arranging a double light source in this way, shadow formation is much reduced and the small reflectors do not obstruct the operator. Nevertheless, the small reflectors impede the free circulation of air round the bulb, and if bulbs of a wattage greater than 36 are fitted, the cooling may be found inadequate for continuous working. Although these 24-watt bulbs can quite well be supplied from the mains through a transformer, an ordinary 230-volt lamp will probably be found more convenient where space is not restricted, and for bench lighting the lamp head can be adapted to take the larger bulbs carried in a combined lamp holder and switch. To adapt the lamp head in this way, a brass ring is fitted to the head fork and pivots on the two spring-loaded trunnion screws of the standard fitting. The method of making this alteration is illustrated in Fig. 11.

The reach of these miniature anglepoise lamps is approximately 24 in., but the utility of the appliance may be greatly enhanced if a longer reach is arranged. One of these lamps is shown in Fig. 12 adapted for bench lighting and, as will be seen, the base is bolted to a short length of angle-iron to serve as a means of attachment either to a wooden panel or to the wall itself.

The standard form of base can, of course, be utilised to mount the lamp on a pedestal or directly to some part of the lathe.

A combined switch and lamp holder has been fitted to carry the large, pear-shaped aluminium reflector surrounding the 230-volt, 40-watt bulb. In addition, the reach of the appliance has been

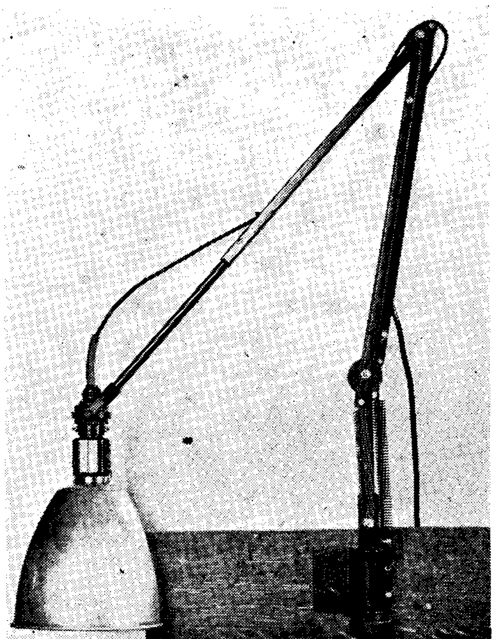


*Fig.* 12. *Anglepoise lamp fitted with an extension arm and lampholder switch*

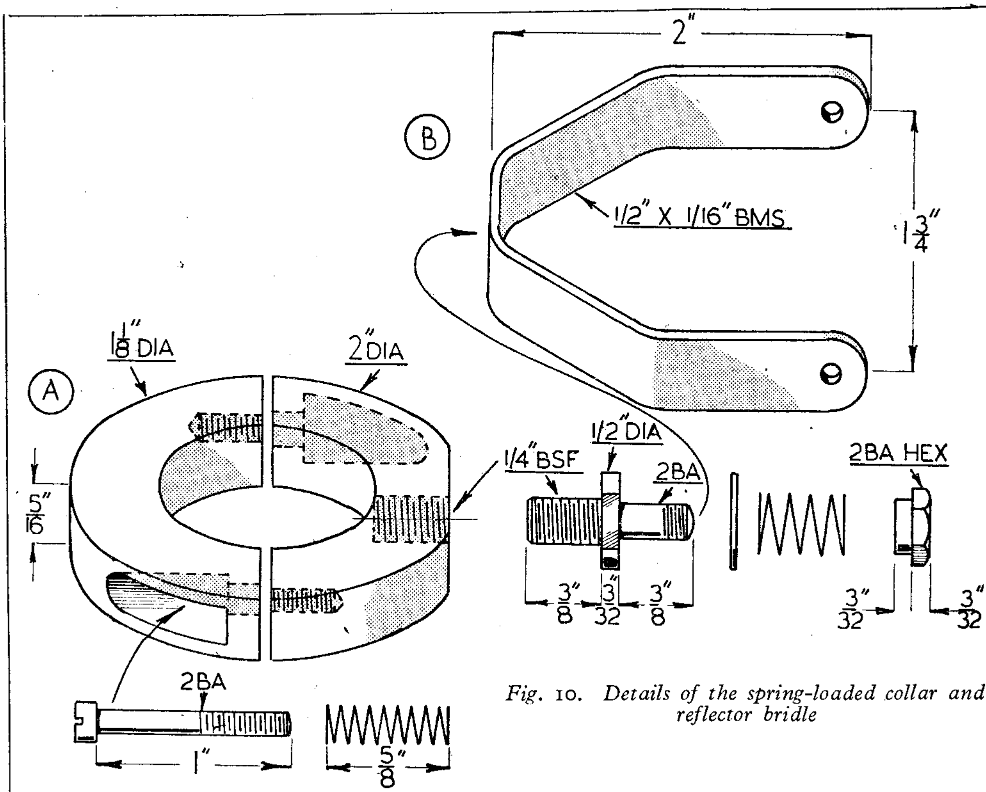



*Fig. 10. Details of the spring-loaded collar and reflector bridle*

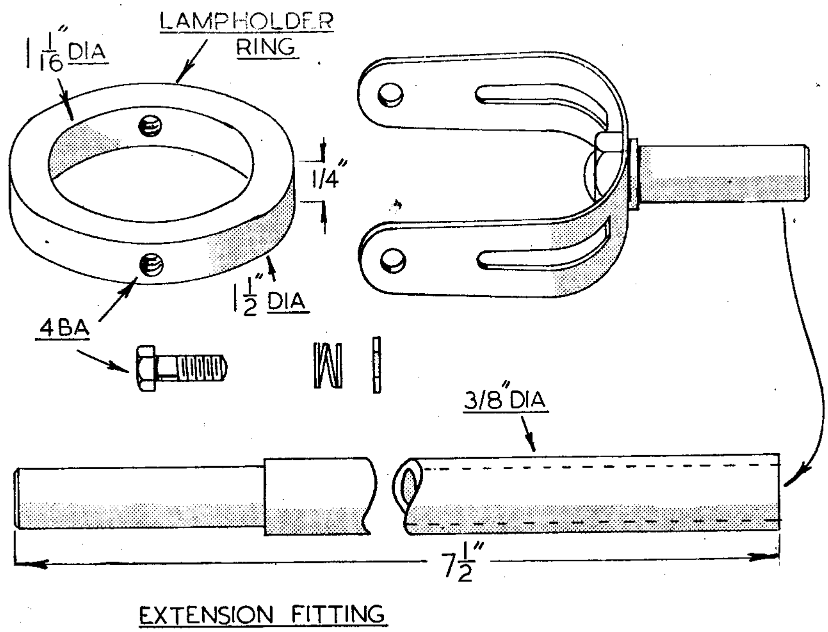
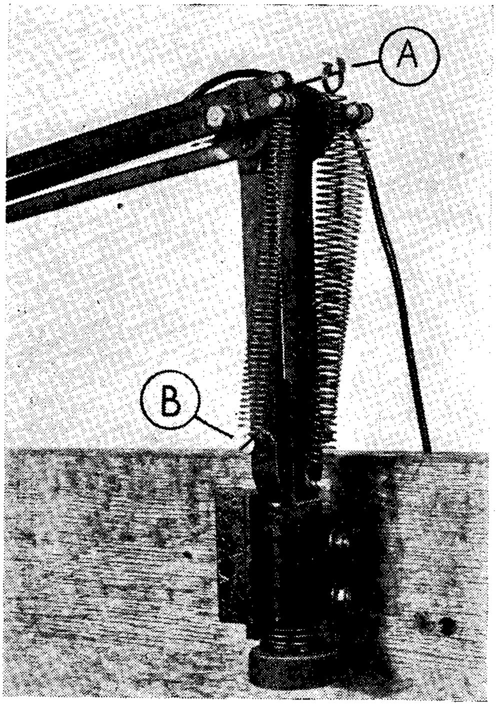



*Fig. 11. The lamp holder attachment ring and extension fitting*




increased 6 in. by fitting a light, tubular extension to the upper arm, in place of the spindle of the standard lamp fork.

The construction of this extension-piece is illustrated in Fig. 12.

With the addition of the heavier lamp fittings and the increased leverage thereby exerted on the two limb joints, the spring tension becomes inadequate to control the movements of the lamp.

The limb joints can, however, be made to work more stiffly by tightening the bolts adjusting the working friction in the joints. Nevertheless, the lamp will work better if the tension of the control spring is increased. For this purpose, as shown in Fig. 13, the central spring is anchored in the lowest position on the pillar and, in addition, the spring leverage is increased by fitting an extension-piece, made of $\frac{1}{4}$-in. square brass rod, to the upper limb, as shown at *A*. The tension of the two side springs is also increased by anchoring their lower ends in the position indicated at *B*. As a result of these modifications, the movements of the long-reach lamp are quite well controlled, and very little additional tightening of the friction joints is required to make the lamp self-supporting with changes of position.

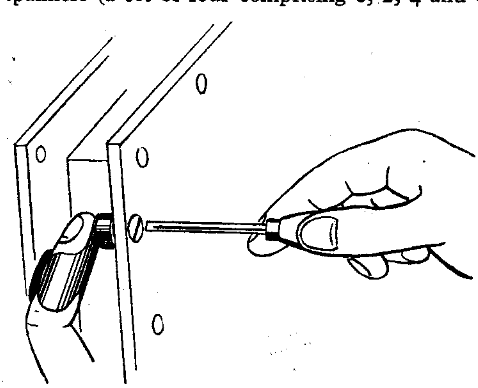
*Left—Fig. 13. Showing methods of increasing the spring tension*

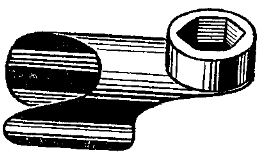
# SOME USEFUL TOOLS

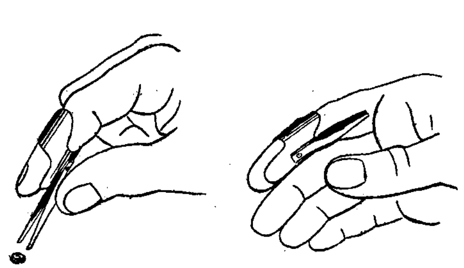
THE ACRU ELECTRIC TOOL MANUFACTURING CO. LTD., 123, Hyde Road, Ardwick, Manchester, 12, have sent us a leaflet listing a number of interesting and useful tools which we think would prove of value to a number of our readers.

Locating screws in awkward places is always a problem, and in this direction the "Pyrogrip," a simple screwdriver attachment, will be found a strong ally.

The Acru finger tools are supplied as box spanners (a set of four comprising 0, 2, 4 and 6 B.A. sizes) screwdrivers and tweezers. The box spanners, which cost 7s. 6d. per set of four, will be found invaluable in tightening screws, the nuts of which are located in inaccessible places. The screwdrivers are 3s. 6d. per set of two and one thimble and tweezers, sharp, flat or round-nose, fitted to thimble, 2s. 10d. All tools are chromium-plated.







# *" That Wonderful Year . . . . . ."

## by " The Domine"

IN the rather brief time left at our disposal before we must seek our Time machine once more, to return to our own century, perhaps it would be as well to have a general stroll round the Crystal Palace, rather than stay in one section. For, as with the South Bank Exhibition of our own day, there's so much to see that we are bound to miss a number of exhibits, anyway !

Here, for example, is an instrument with which

*Concluded from page 208, " M.E.," August 16, 1951.

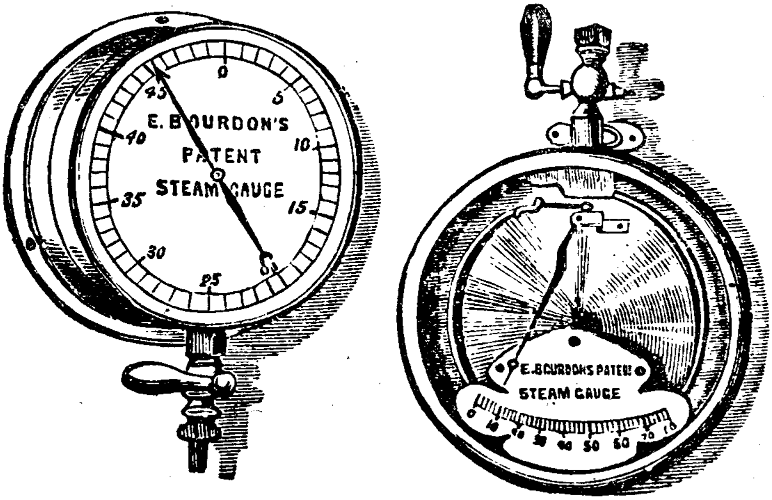



*Fig. 48. Bourdon's patent metallic steam-gauge, worked on " a newly discovered physical law " : these two examples were shown in the Great Exhibition of 1851, among others, including vacuum-gauges*

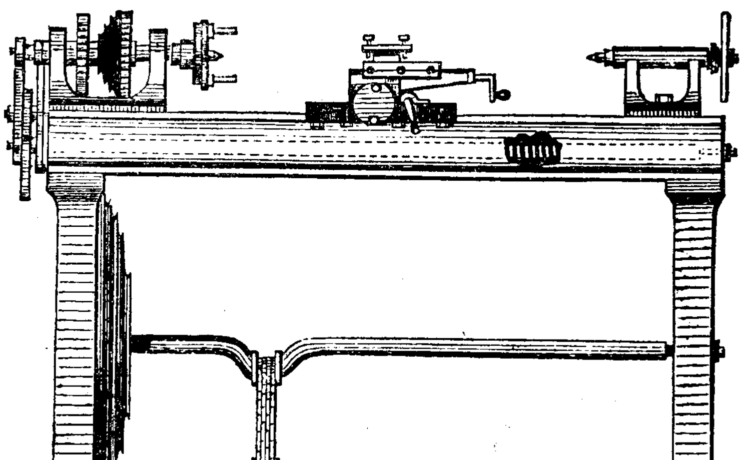


*Fig. 49. Whitworth's self-acting foot lathe had a central leadscrew similar to the 3½-in. Drummond*

all model engineers are perfectly familiar, yet which in 1851 is a completely new instrument. It is Mons. E. Bourdon's "Patent Metallic Steam-Gauge" (Fig. 48), working on a "new principle ... It appears that if a brass or thin sheet iron or steel tube be nearly flattened, and afterwards coiled, the effect of an inward pressure of steam or water is to force it towards its original shape ... This law has been worked out with admirable ingenuity ... Here is a most perfect pressure gauge, of a simplicity hitherto beyond conception." That is what *The Illustrated Exhibitor*, a magazine of the period, says, and we can confirm the last two sentences a century later.

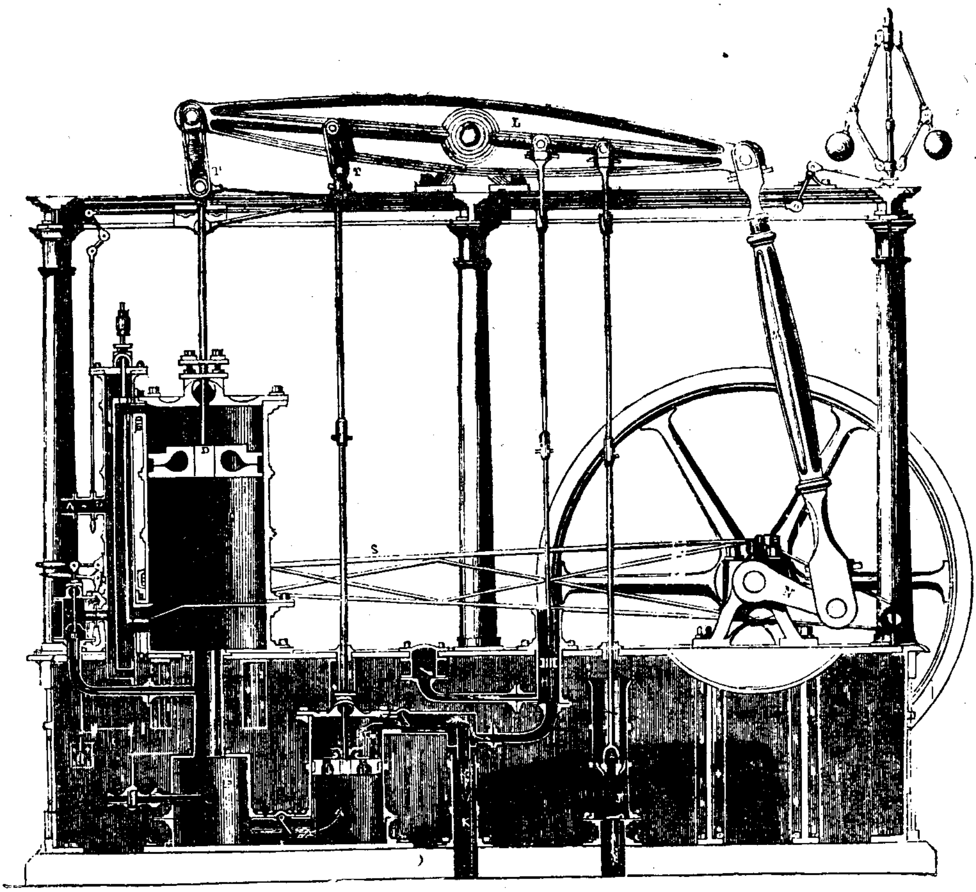


*Fig. 50. Watkin & Hill's working sectional model of a beam engine, with jet condenser under the cylinder and air-pump next to it. The third rod drives the "force pump" which feeds the boiler with hot water from the condenser, and the other pump feeds cold water to the "cistern" from which the jet is supplied*

### World Amazement!

In the engineering section, we find many of the machine tools which are making the Industrial Revolution which is transforming Britain and amazing the world. On the stand of Whitworth's, of Manchester, for example, is a great show of turning, planing, boring, and drilling machines, of all types and sizes; but what strikes our eyes, as model engineers, is the "self-acting foot lathe" (Fig. 49) which so much resembles the veteran treadle lathes that many of the fraternity use even in 1951. Yes, even to the lead-screw placed between the sliding ways as in the Drummond recently commented on in THE MODEL ENGINEER. And over there is the machine which has the capacity of being able to measure accurately to the millionth part of an inch—quite a feat for 1851!

### More Models

Fig. 50 shows Messrs. Watkin & Hill's "Sectional Model of a Double-action Condensing Steam Engine," which we find surrounded by a crowd anxious to understand the intricacies of this development of Watt's original invention. On the same stand is a further sectional model, of one of Sharp & Roberts' Improved Locomotive Engines.

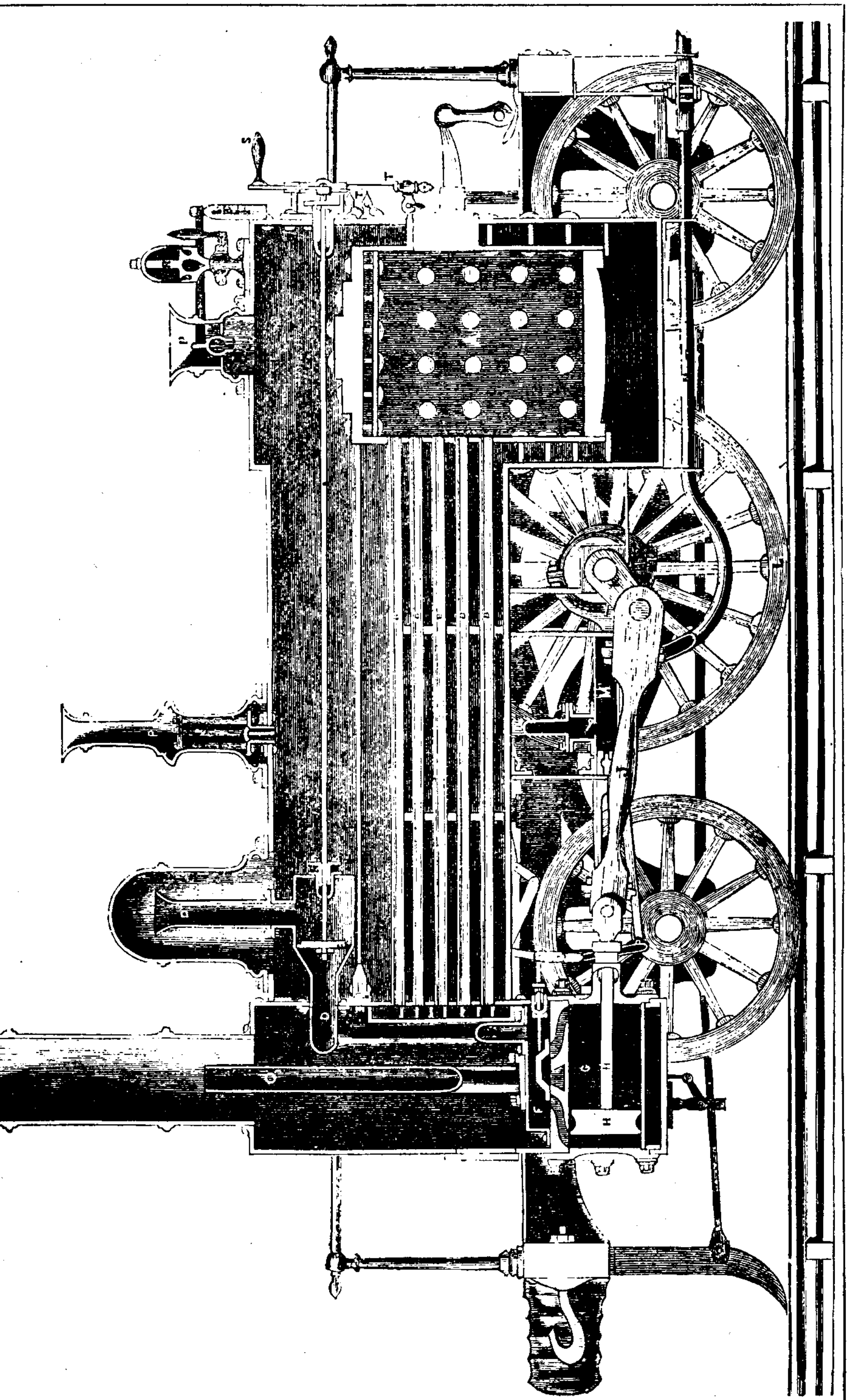


*Fig. 51. A sectional working model, also by Watkin & Hill, of Messrs. Sharp & Roberts' "most improved species of locomotive engine" of 1851*

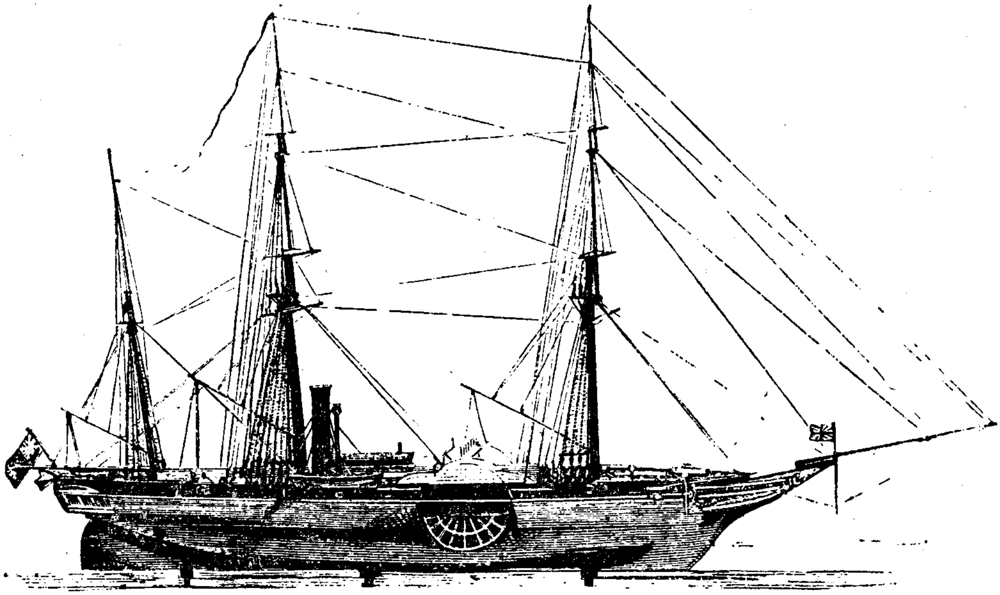


*Fig. 52. A fine model of Her Mcjesty's steam ship "Medea," one of the fastest ships of the period*

**Marine Section**

In Class 8, comprising naval architecture and military engineering, are also many models, as might be expected. One of the nicest of these is J. Hudson's $\frac{1}{4}$-in. scale model of H.M. Steamship *Medea*, one of the fastest paddle-steamers under canvas in the Royal Navy. She was designed and built by Oliver Lang, master shipwright at Woolwich dockyard; in 1850 she had the honour of bringing the Koh-i-noor diamond to England, on which occasion she performed a record passage from the Cape. (Fig. 52.)

Close at hand is a working model by A. B. Sturdee of a steamship with a twin-stern (Fig. 53) — an early idea which others later developed into the tunnel-stern much used in river-steamers and in modern lifeboats. The inventor's idea is to protect the propeller from damage by shot, floating ice, hawsers, weed and other hazards. In addition, there is a more direct flow of water to and from the screw, and the stern is made stronger; whilst if one rudder is damaged, the ship may still be steered with the other.

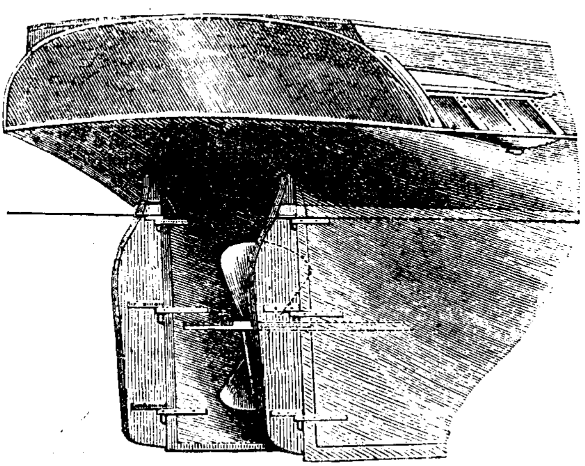


*Fig. 53. Sturdee's twin-stern steam ship, forerunner of the tunnel stern*

Another new idea, which seems scarcely as practical, is Lieut. Penrice's new propeller for steam-vessels, shown in Fig. 54 as viewed from the inside and the outside of the vessel. Worked by cranks (which presumably are to be directly attached to the connecting-rods of the engines), it will be seen that the propellers push against the water on the outward stroke, but are lifted out on the return.

The Admiralty have a large number of models — over 70 of them — including nine half-models of warships fitted with screw-propellers. Among the others, the *Queen*, Mediterranean flagship of 116 guns, is well-represented, first by a half-model, then

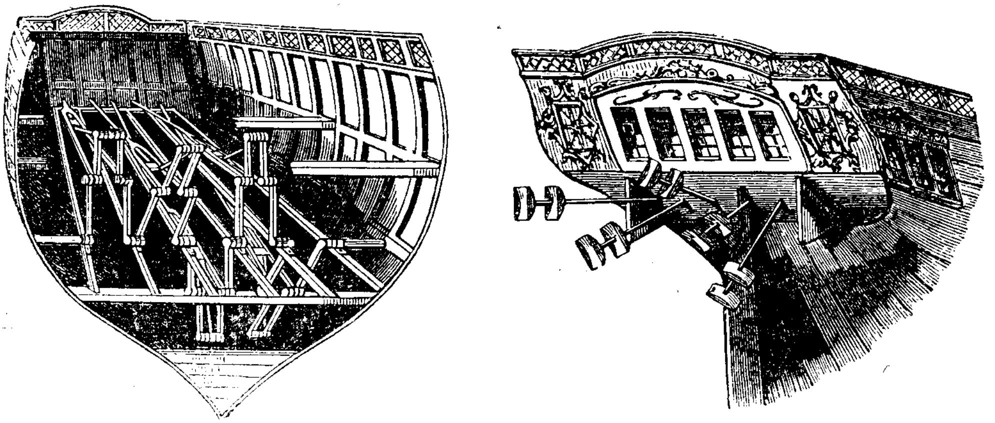


*Fig. 54. Invented by Lieut. Penrice, R.E., of the Ordnance Survey, the "peculiar mechanical arrangements" of this new propeller were supposed to give greater efficiency than the screw propeller*

by a whole-model, and finally by models of her bow, stern, and transverse sections. (I seem to remember the latter in 1951 in the Maritime Museum at Greenwich, by the way!)

Well, good things must come to an end, and it's time we were heading for our Time machine. I hope nobody has interfered with it, but after all we *did* park it in that clump of bushes.

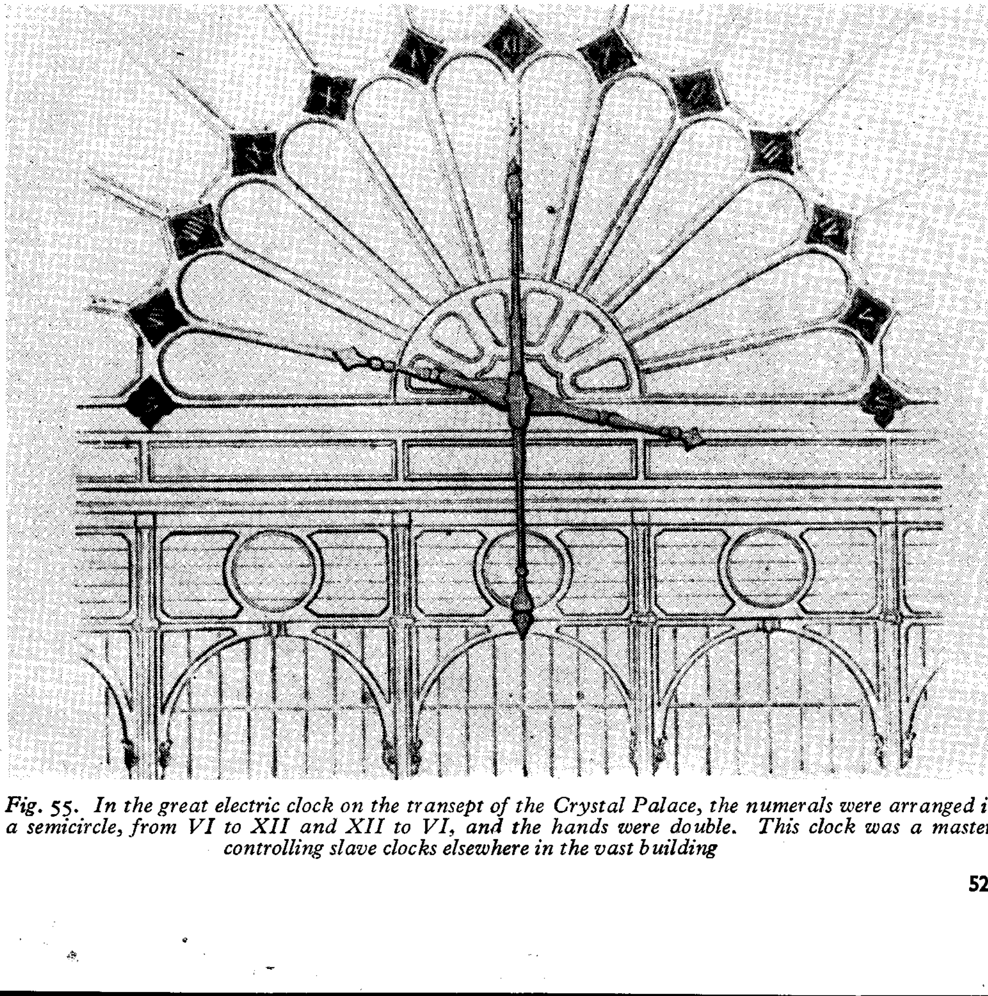


*Fig. 55. In the great electric clock on the transept of the Crystal Palace, the numerals were arranged in a semicircle, from VI to XII and XII to VI, and the hands were double. This clock was a master, controlling slave clocks elsewhere in the vast building*

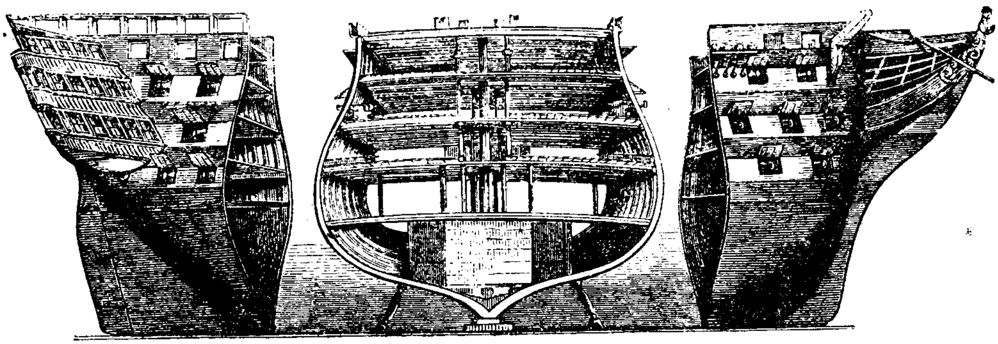


*Fig. 56. These models of the sections of H.M.S. "Queen" show the arrangement of the decks of this 116-gun sailing warship*

Did you notice the big electric clock as we came in, incidentally? No? Well, there it is high on the end of the transept. A unique design, with a semi-circular face to match the line of the roof, and with "double" hands, which, of course, are necessitated by the design itself.

What's that? The Crystal Palace looks different somehow from the one you remember at Sydenham? Well, the explanation is simply that when it was re-erected there, Paxton enlarged the structure in length, breadth, and height, and added a further transept at each end. In addition, because of the elevation of the site, the famous water-towers at either end were built to ensure an adequate pressure in the water supply. Satisfied? Good! Then here we are at the machine. Climb aboard, hold your breath, and we're off—back to the age of the gas-turbine and the atom. Let's leave it to posterity to decide which is the better period of the two, shall we?

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# For the Bookshelf

**The Water Mills of Sheffield,** by W. T. Miller, M.Inst.C.E., M.I.Mech.E. 100 pages, 10 in. × 8 in., price 7s. 6d. net. (Fourth edition.)

The Sheffield Trades Historical Society has recently published a revised edition of this work, with certain material included which has come to light since the original publication in 1936.

It is not widely realised, even in the Sheffield area, that the Steel City owed its position and pre-eminence originally to the abundance of water power supplied by its seven rivers. The author has delved deep into old records and manuscripts, as well as into more modern sources of information, and the result is a very fascinating book, of interest not only to the local inhabitant. Numerous illustrations and maps add to the interest.

The mills dealt with were mostly concerned with the iron and (later) the steel industry, including forges, grinding-wheels, tilts, and rolling mills, but there were also corn, glass, and snuff-mills in the area. (Incidentally, even today there are a few water-driven mills left, including a rolling-mill, tilting-shop, corn-mill, and snuff-mill.)

Anyone interested in the work and history of the old millwrights and engineers will be interested in this book. It is obtainable from the secretary of the Sheffield Trades Historical Society at 197, Brookhill, Sheffield, 3.—W.J.H.

**The First Hundred Road Motors,** by R. W. Kidner. Published by the Oakwood Press at 9s. net. Size $8\frac{3}{4}$ in. × $5\frac{3}{4}$ in.

This book suggests a new field for the model engineer who wishes to portray an unusual model. Not many have chosen the early mechanically-propelled vehicles as a prototype. The disadvantage of scarcity of reliable information, a point which is borne out in the book, is probably the answer.

However, for those who wonder about what went on in the pre-petrol era, this book is to be recommended. It has copious illustrations in the form of line drawings and one or two interesting photographs which would prove helpful in deciding on a prototype; but for the reasons given above, the book is really of greater value to the student of the history of mechanically-propelled vehicles, than for those model engineers who are not prepared to do research work to enable them to make the necessary working drawings.—C.B.M.